the OIL AND GAS JOURNAL

LATEST WELL-DRILLING RECORD ANOTHER TRIUMPH FOR TIMKEN® BEARINGS

Where new oil well drilling records are made — there you will find Timken tapered roller bearings. They again have proved their superiority in connection with the sinking of the Superior Oil Company's 20,521-foot Pacific Creek Unit No. 1, Rock Springs, Wyoming — the deepest hole ever drilled.

Timken bearings are used in the following "Ideal" equipment employed on this job:

1—Type 760-T Crown Block — sheaves
1—Type 660-TD Traveling Block — sheaves
1—Type C-350 Power Slush Pump — crank and pinion shafts
2—Type E-700 Power Slush Pumps — crank and pinion shafts
1—Type 160 Draw Works — Type "A" universal catheads and drum shaft water connection
1—Type "E" Wire Line Anchor — line drum shaft

When the National Supply Company designed this equipment for plus 20,000 foot drilling they were never in doubt about the bearings. They knew from past experience that Timken bearings could be depended upon under every drilling condition that might be encountered.

THE TIMKEN ROLLER BEARING COMPANY
CANTON 6, OHIO
Cable Address "TIMROSCO"

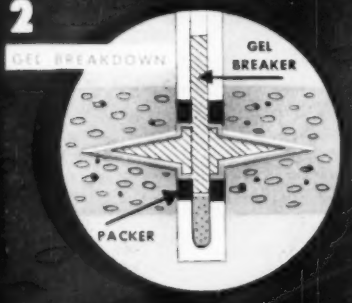
TIMKEN
TAPERED ROLLER BEARINGS

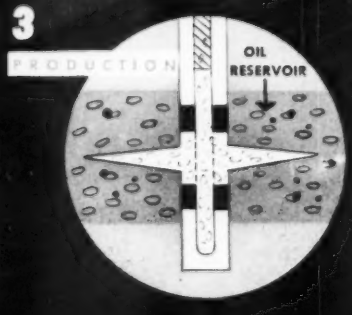
"Ideal" Type 160 rig showing Timken bearing equipped slush pumps.

NOT JUST A BALL ○ NOT JUST A ROLLER ⊂⊃ THE TIMKEN TAPERED ROLLER ⊂⊃ BEARING TAKES RADIAL ◐ AND THRUST —◐— LOADS OR ANY COMBINATION

HYDRAFRAC
SERVICE

1 HYDRAULIC FORMATION FRACTURING





A new **HOWCO** *service*

Actual results definitely establish the Hydrafrac* Process as a factor of *major importance* in stepping up the production of old and new wells. By the use of hydraulic pressure and specially developed fluids and methods, Hydrafrac Service creates a permanent increase in permeability—with production increases which, in the first group of wells treated, ranged from *28 to 108 per cent.* Ask the nearest Howco representative for facts and performance data.

*Hydrafrac is a service mark of Stanolind Oil & Gas Company.

HALLIBURTON OIL WELL CEMENTING CO.

DUNCAN, OKLAHOMA

unscrambled, they all say one thing...

Low Cost Per Unit of Work

and that means...

Bethlehem Wire Rope

Ever stop to figure the *real* cost of your wire rope—the cost per unit of work? Do you know, for example, what your rope is costing you for every yard of rock it moves? Or every ton of ore, coal, or slate it hoists? Or every ton-mile in oil-country rotary drilling?

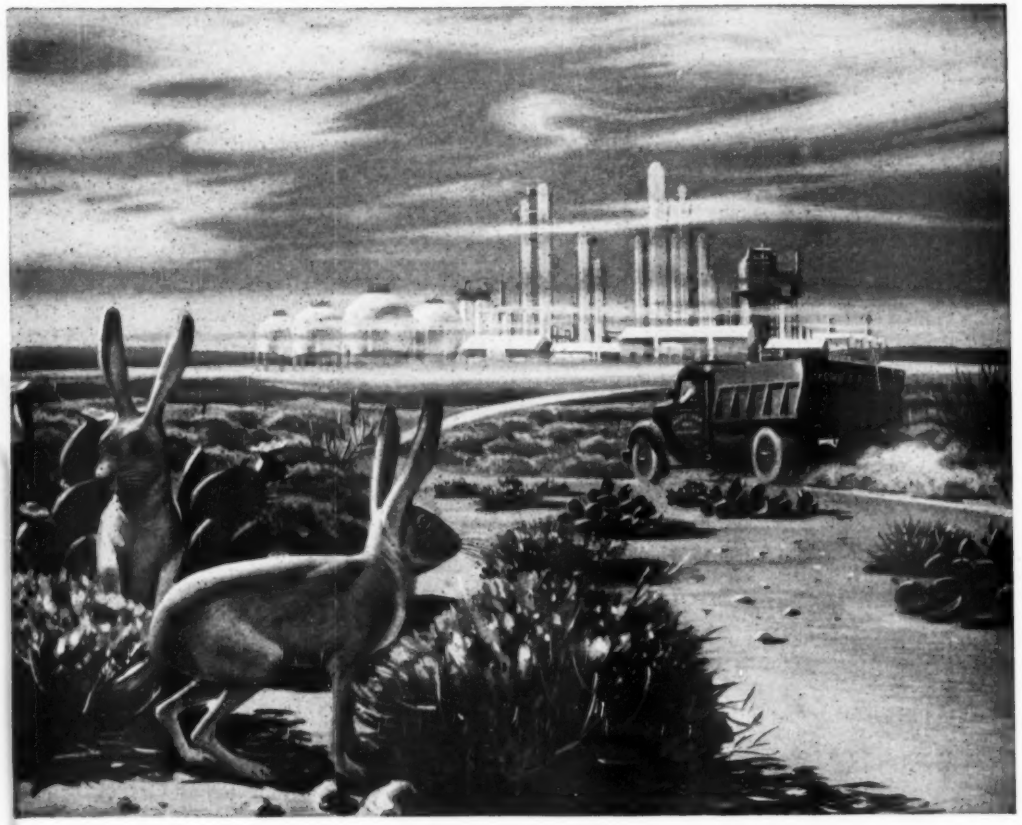
This yardstick—cost per unit of work—is the only *true* measure of wire-rope expense. Purchase price alone is not the answer. The rope with the lowest price tag isn't necessarily a bargain. It's the service life—the total amount of work it will do—that determines your actual cost. That's why we say: specify Bethlehem.

Bethlehem wire rope is a quality product, one carefully and conscientiously built. From the making of the steel to the final reeling and shipping, it is a product that merits your confidence. Because of its long life in service, its cost per unit of work is *low;* it is an economical rope in the truest sense.

Order some today. Check its performance—check thoroughly. We believe you'll soon agree that there isn't a better, more economical rope on the market.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Export Distributor: Bethlehem Steel Export Corporation



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If there is an industrial frontier in America today, it certainly lies in the rich, bustling Southwest. Brown & Root, Inc., started here more than 30 years ago. Our long association with the terrain, soil, working conditions, and people of this vast empire has established Brown & Root as this section's foremost construction and engineering company. There is no substitute for experience, and if you have Southwestern plans, Brown & Root can help you.

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Look to Crane first . . . and save yourself the time and trouble of looking elsewhere. If it's piping equipment, most likely it's in the Crane line. One order to this **Single Source of Supply** covers everything you need . . . power, process or general service piping . . . through local well-stocked Crane Branches and Wholesalers.

Take This Treating and Sweetening Process Piping, for example. The valves, fittings, pipe and accessories shown here represent but a fraction of the complete selection available at Crane. Getting everything from Crane has other advantages, too. **One Responsibility** for materials helps to assure the best possible installations, avoids delays on the job. **One Standard of Quality** in every item assures dependable performance from end to end of your piping systems.

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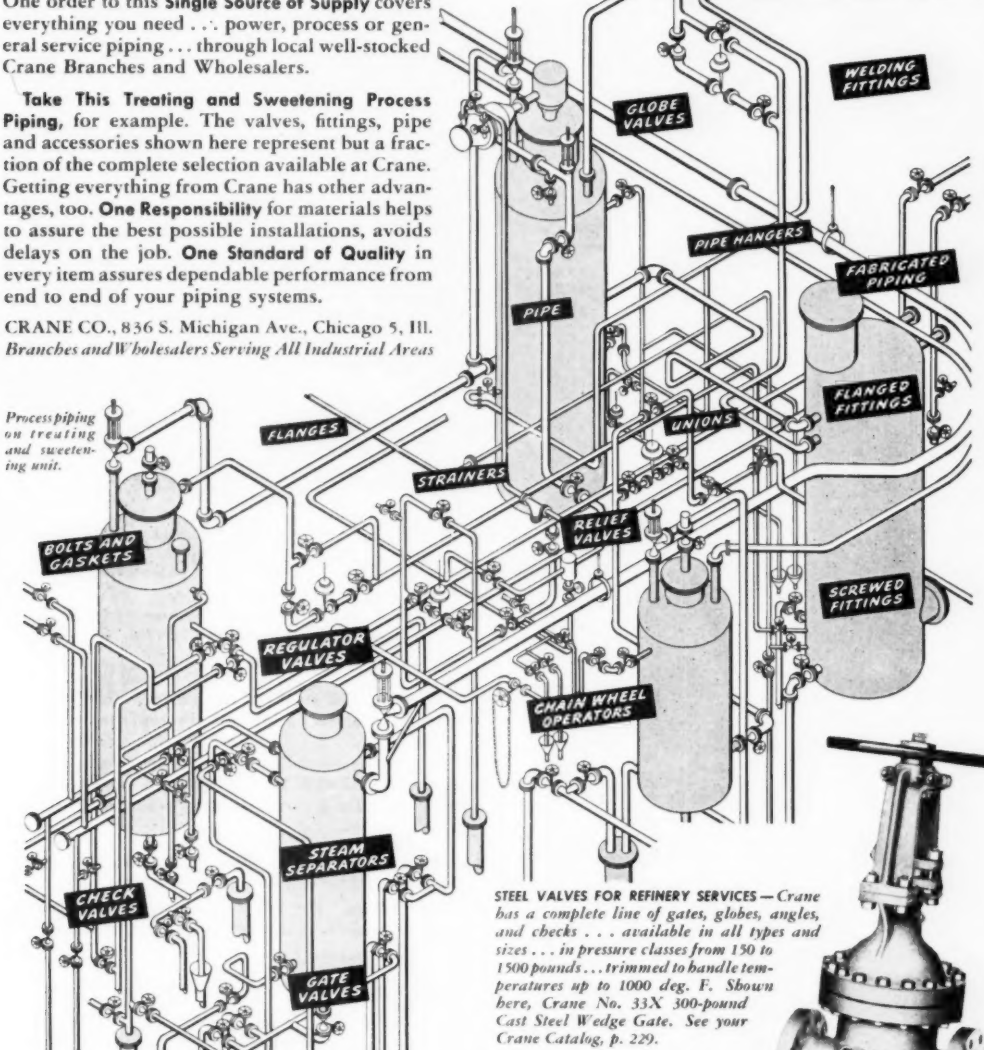
RESPONSIBILITY
STANDARD OF QUALITY



Process piping on treating and sweetening unit.

STEEL VALVES FOR REFINERY SERVICES — *Crane has a complete line of gates, globes, angles, and checks . . . available in all types and sizes . . . in pressure classes from 150 to 1500 pounds . . . trimmed to handle temperatures up to 1000 deg. F. Shown here, Crane No. 33X 300-pound Cast Steel Wedge Gate. See your Crane Catalog, p. 229.*

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PIPE • PLUMBING
AND HEATING

CRANE

FOR EVERY PIPING SYSTEM

The Oil and Gas Journal, published Thursdays by The Petroleum Publishing Company. Entered as second-class matter September 1, 1910, at post office at Tulsa, Okla., under act of March 3, 1879. U. S. and foreign rates to the petroleum industry, $3 yearly. Copyright 1949.

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FOR ALL MY CEMENT JOBS!"

LARKIN'S "PERFECT CIRCLE" Cementing Shoes

Thousands of runs have proved that it pays off to use Larkin's "Perfect Circle" Geyser Shoes of every cement job.

This superior Shoe has every feature to guide and float the longest casing string with the utmost safety.

With the first stroke of the pump it distributes slurry in a perfect circle evenly around the casing.

It gives a turbulent fluid action capable of washing the well bore clean and minimizing channeling for a reasonable distance above the Shoe.

Men who live with oil well cementing problems time and again say "O.K." for Larkin's Geyser Shoes. For brute strength, for dependability, for safe, successful cementing, it's Larkin every time.

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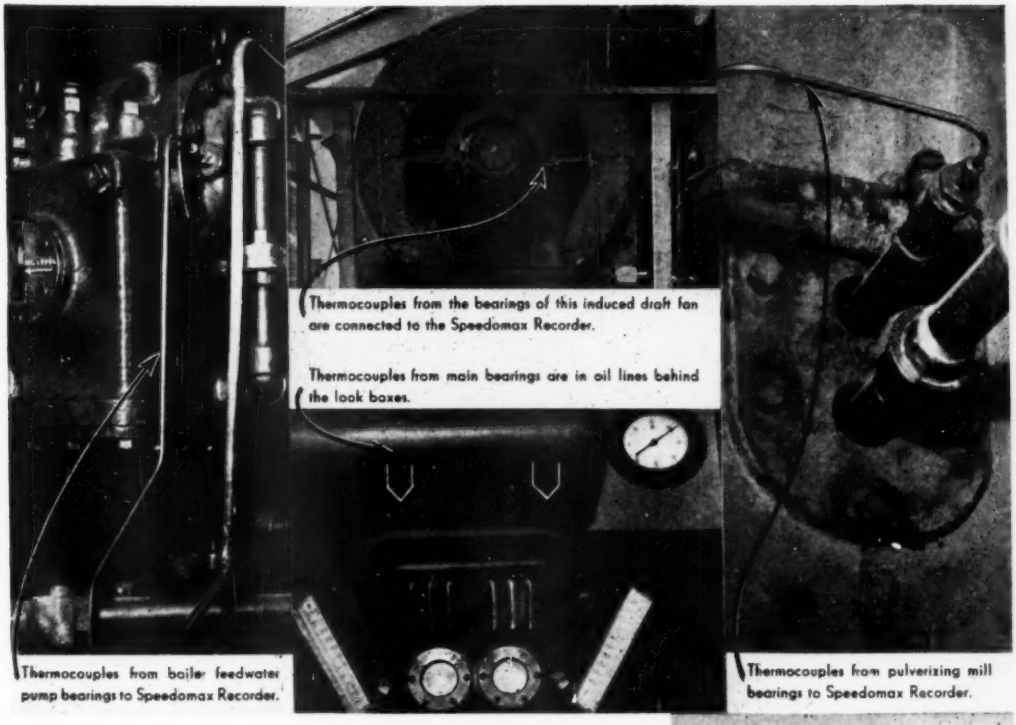


Thermocouples from the bearings of this induced draft fan are connected to the Speedomax Recorder.

Thermocouples from main bearings are in oil lines behind the look boxes.

Thermocouples from boiler feedwater pump bearings to Speedomax Recorder.

Thermocouples from pulverizing mill bearings to Speedomax Recorder.

Temperature From These 4 Points

. . . And 156 More . . .

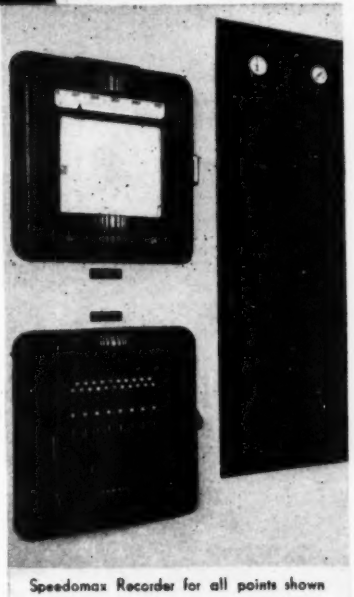
At ONE Speedomax Recorder

Remarkably fast, this new Speedomax offers a definite advance in temperature checking and recording. With Speedomax, an operator can "tour" the temperatures of 160 points in a little less than eleven minutes. He can watch readings as they are automatically indicated; or Speedomax will record them for later examination and for the shift log.

Readings are supplied in such rapid rotation, that it is generally possible to spot any high or low temperature as soon as it develops. In addition, greater operating efficiency is obtained because of the centralization of instrument readings.

The installation procedure is entirely standard. The company's staff simply installs thermocouples at those points from which they desire temperature readings. Couples are connected to the Speedomax equipment in banks of 20 each, with as many as eight banks. Appropriate alarms may be included.

For further information about this versatile temperature checking equipment, simply write for your copy of Folder ND46-33A(1). Address Leeds & Northrup Co., 4959 Stenton Avenue, Philadelphia 44, Penna.



Speedomax Recorder for all points shown and enough more to record a total of 160.

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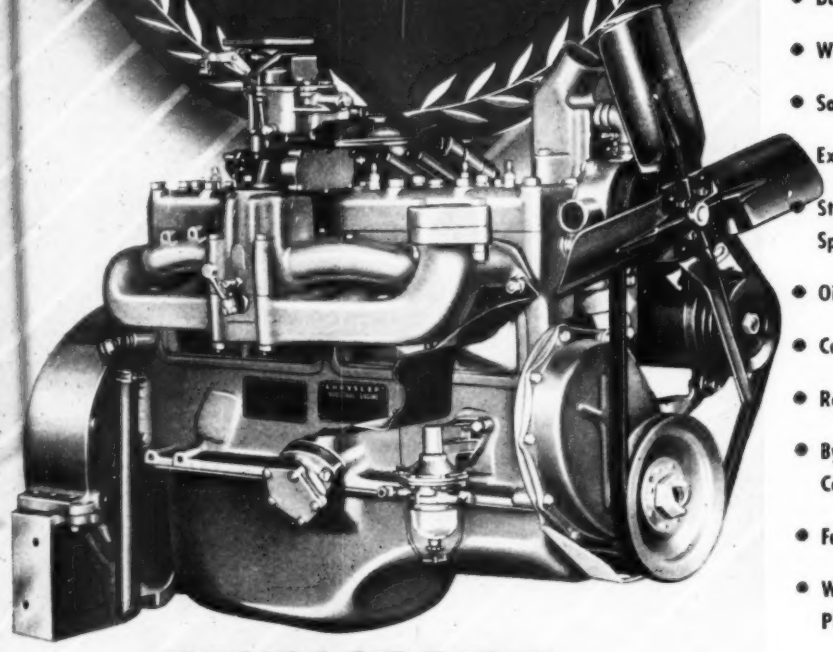

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HORSEPOWER WITH A PEDIGREE

● In the past 25 years, Chrysler Engineers have pioneered, developed or introduced a greater number of noteworthy Engineering and Design Features for gasoline engines than any other manufacturer.

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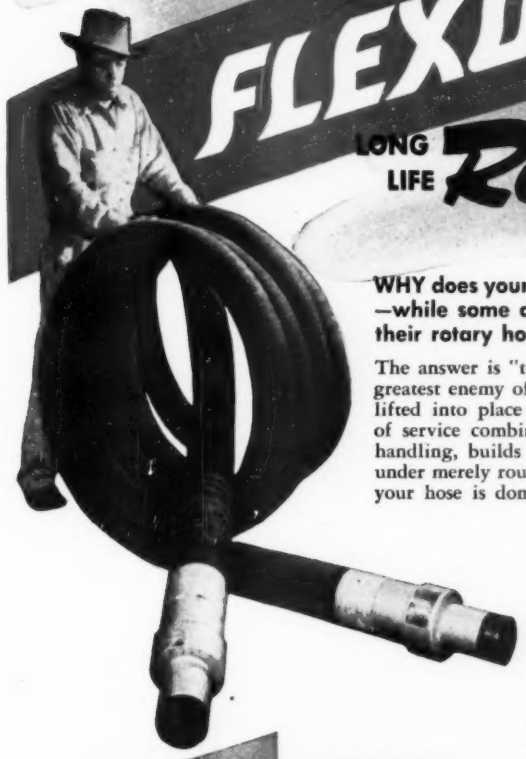
And along with leadership in Engineering and Design has come leadership in Service through a highly developed world-wide service organization. ***Industrial Engine Division, The Chrysler Corporation, 12200 East Jefferson Avenue, Detroit 31, Michigan.***

READ THESE FACTS ABOUT THE

new GOODALL FLEXO CORD LONG LIFE Rotary Hose



WHY does your rotary hose rupture after only several rig moves —while some drillers get well over 150,000 feet of hole with their rotary hose?

The answer is "torsional twist" — which leads to fabric breakage — the greatest enemy of rotary hose. More rotary hoses are damaged in being lifted into place — and during rig moves — than by all other ravages of service combined. Torsional twist, resulting from hasty or careless handling, builds up internal stresses which later cause fabric ruptures under merely routine drilling pressures. And when the fabric ruptures—your hose is done for!

A New Technique in Rotary Hose Construction

Goodall has now effectively overcome this weakness with the development of the new Long-Life FLEXO *CORD* Rotary Hose — with *cord carcass.*

The new Goodall FLEXO *CORD* Rotary Hose is as superior to ordinary rotary hose as cord automobile tires are superior to the old obsolete fabric tires — and for the same reasons!

The new cord structure in FLEXO *CORD* Rotary Hose is not only far stronger than the canvas duck material formerly used — it is laid in multiple plies at precisely the correct transverse angles to withstand torsional twist.

Perfect Balance

Balanced construction — an essential to long life and good performance in rotary hose — is assured by the new Goodall method of winding the steel cables of the pressure element at angles corresponding *exactly* with the angles of the cord plies. This eliminates destructive internal stresses . . . prevents elongation and distortion of the hose under pressure . . . permits it to hang evenly in the rig.

Stronger—More Flexible—Yet Costs No More!

The new Goodall FLEXO *CORD* Rotary Hose is more flexible — for easier handling. It is also stronger and more durable than any rotary hose ever manufactured — yet there is no increase in price to you!

Field-Tested and Proven

Extensive field tests under severe drilling conditions have proved that the new Goodall FLEXO *CORD* Rotary Hose has what it takes to withstand torsional twist, whipping, jerking and pulsation.

This means longer service life, better performance — substantial savings for you. Make your *next* hose, Goodall FLEXO *CORD* Rotary Hose!

2082

To get longer service from your Goodall Rotary Hose, use a swivel joint at each end.

GOODALL "Extras"

Barney Couplings — the only couplings stronger than the hose itself. Goodall Service Department — the only complete repair department maintained exclusively for rotary hose.

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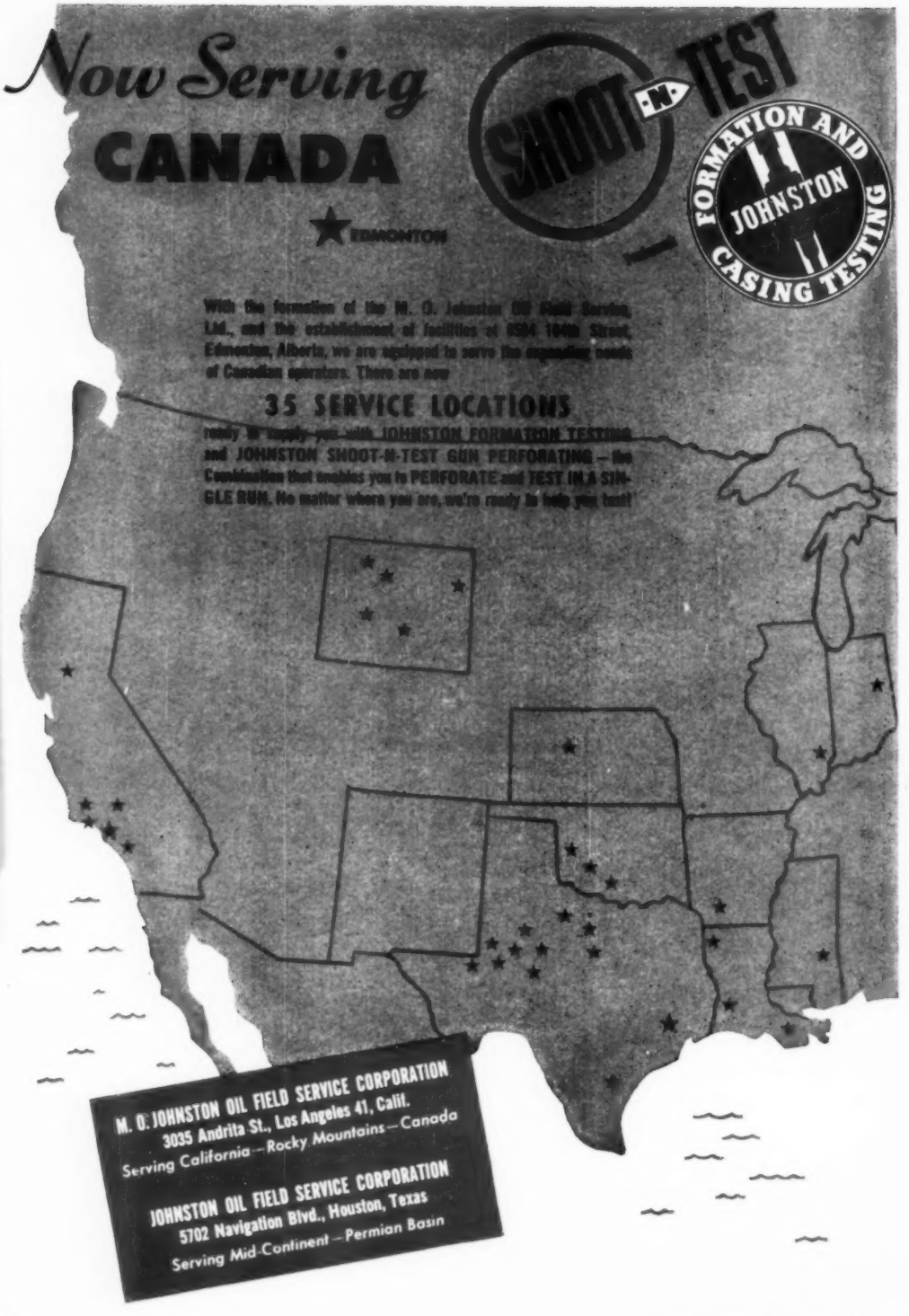
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EMSCO "J" SERIES COMPOUNDING TRANSMISSIONS

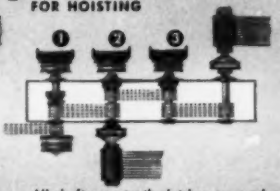
FURNISHING THE ULTIMATE IN OPERATING FLEXIBILITY, PORTABILITY, RIGIDITY AND EFFICIENCY— MAY BE POWERED BY TWO, THREE OR FOUR ENGINES OF ALMOST ANY TYPE OR MAKE— MAY BE EQUIPPED WITH NONE, ONE OR TWO PEDESTAL-TYPE PUMP DRIVES

TYPICAL DRIVE ARRANGEMENTS

1 FOR MIXING MUD WHILE DRILLING

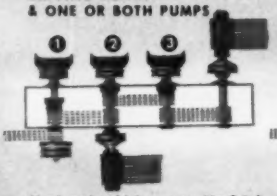
No. 1 engine driving rotary. No. 2 engine driving side pump for drilling. No. 3 engine driving back pump for mud mixing. Pumps may be driven at different speeds simultaneously. All compounding clutches disengaged.

3 ENGINES COMPOUNDED FOR HOISTING



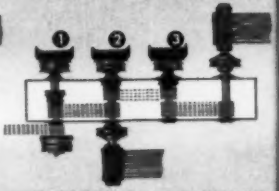
All shaft gear tooth clutches engaged compounding power of all three engines for driving drawworks. Slush pump Fawick clutches disengaged.

2 ENGINES COMPOUNDED FOR DRIVING ROTARY & ONE OR BOTH PUMPS



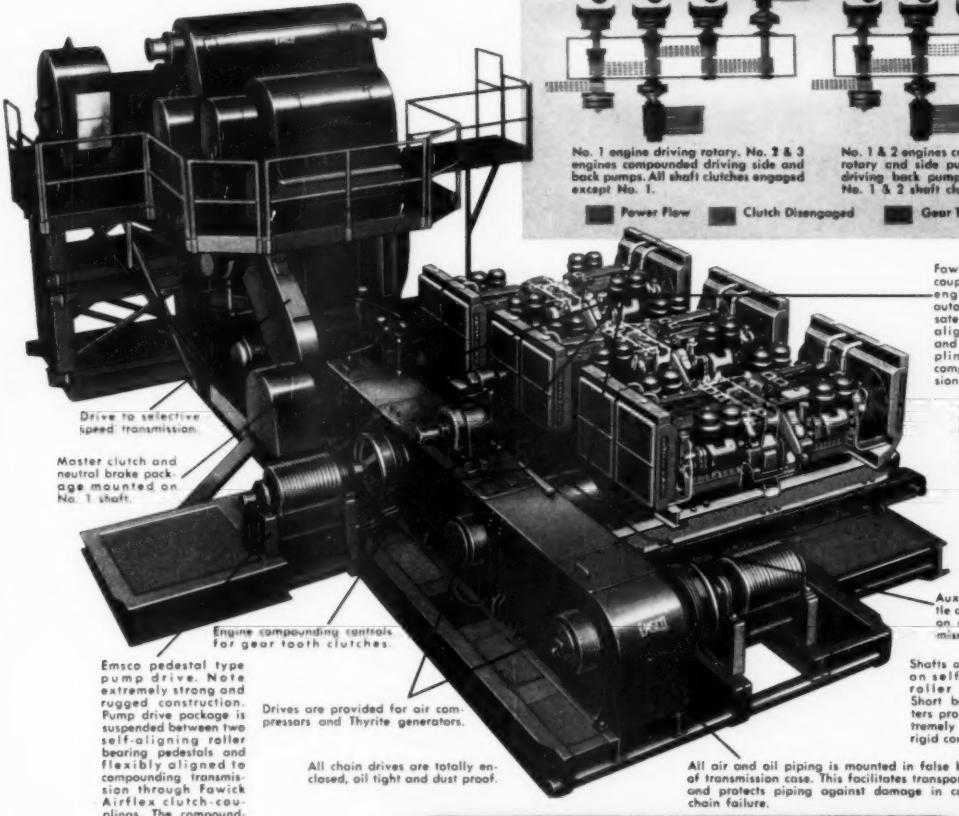
No. 1 engine driving rotary. No. 2 & 3 engines compounded driving side and back pumps. All shaft clutches engaged except No. 1.

4 ENGINES COMPOUNDED FOR DRILLING WHILE MIXING MUD



No. 1 & 2 engines compounded driving rotary and side pump. No. 3 engine driving back pump for mixing mud. No. 1 & 2 shaft clutches engaged.

Power Flow · Clutch Disengaged · Gear Tooth Compounding Clutches



Fawick Airflex clutch-couplings are used for engine clutches. They automatically compensate for any minor misalignment of engines and permit close coupling of engines and compounding transmission.

All shaft bearings and chain drives are pressure oil lubricated by circulating oil bath lubrication system.

Two large slush pumps may be used. This eliminates need for costly independent slush pump unit.

Auxiliary engine throttle controls are mounted on compounding transmission.

Drive to selective speed transmission.

Master clutch and neutral brake package mounted on No. 1 shaft.

Engine compounding controls for gear tooth clutches.

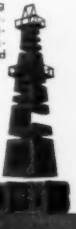
Emsco pedestal type pump drive. Note extremely strong and rugged construction. Pump drive package is suspended between two self-aligning roller bearing pedestals and flexibly aligned to compounding transmission through Fawick Airflex clutch-couplings. The compounding transmission is moved intact—no internal parts are exposed to the elements.

Drives are provided for air compressors and Thyrite generators.

All chain drives are totally enclosed, oil tight and dust proof.

All air and oil piping is mounted in false bottom of transmission case. This facilitates transportation and protects piping against damage in case of chain failure.

Shafts are mounted on self-aligning roller bearings. Short bearing centers provide an extremely strong and rigid construction.



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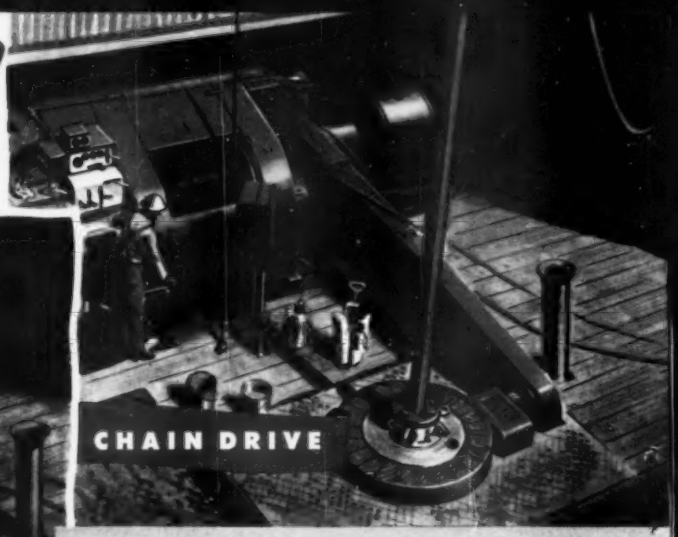
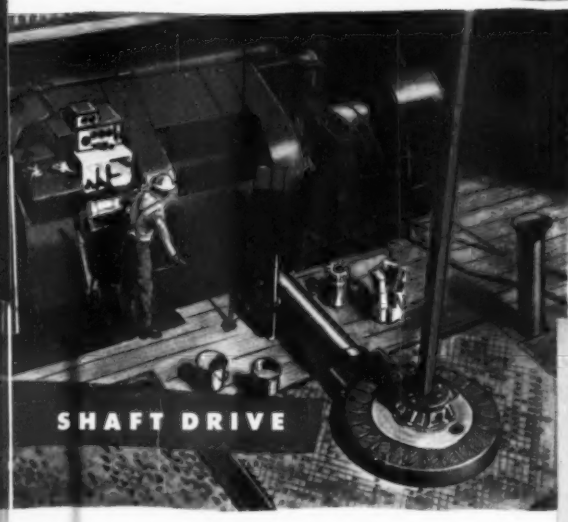
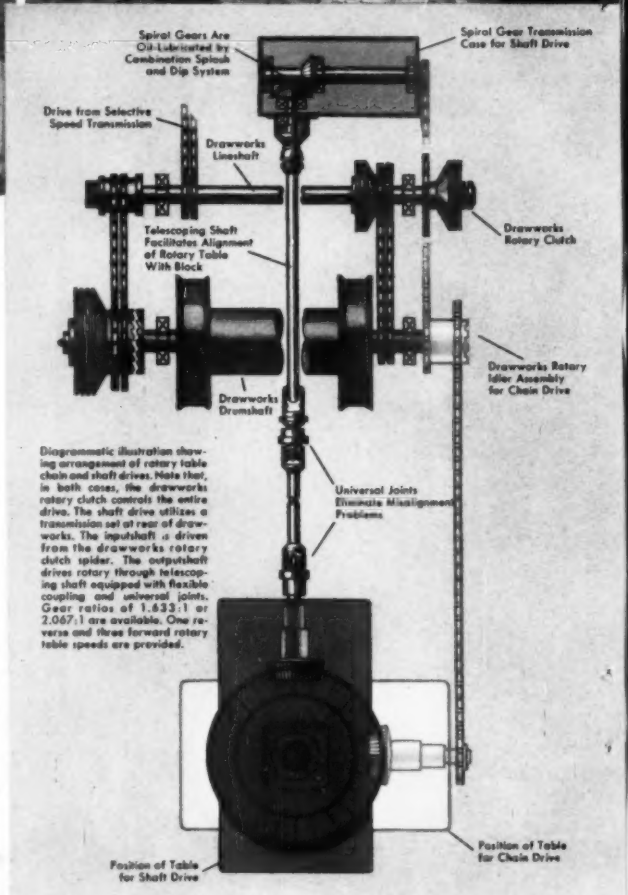




ANOTHER EXAMPLE OF THE *Versatility* OF EMSCO "J" SERIES DRILLING RIGS

Emsco "J" Series Drilling Rigs have been appropriately called the most versatile power rigs in the market. They offer installation and operating flexibilities that no other rig manufacturer can duplicate. Take the choice of rotary drives for example. All Emsco J-Rigs, new or old, can be equipped with either chain or shaft drives for the rotary machine. Emsco pioneered the development of totally enclosed, flood lubricated, streamlined rotary chain guards. They are the most successful guards of their type in the field. Their popularity is evidenced by their use with many makes of drawworks and rotaries. The Emsco rotary shaft drive arrangement used on Emsco J-Rigs is equally as popular with those who prefer to shaft drive their rotaries. Emsco J-Rigs now operating in the field may be quickly and economically converted from chain to shaft drives. You pick the drive best suited for your operations. And, for different locations, you can quickly change from one drive to the other. No compromise in operating efficiency need ever be made. This important operating versatility is found only with Emsco J-Rigs. Investigate this, and other important exclusive features of Emsco "J" Series Rigs—the most versatile power rigs in the market.


Spiral Gears Are Oil-Lubricated by Combination Splash and Dip System
Spiral Gear Transmission Case for Shaft Drive
Drive from Selective Speed Transmission
Drawworks Lineshaft
Drawworks Rotary Clutch
Telescoping Shaft Facilitates Alignment of Rotary Table With Block
Drawworks Rotary Idler Assembly for Chain Drive
Drawworks Drumshaft
Diagrammatic illustration showing arrangement of rotary table chain and shaft drives. Note that, in both cases, the drawworks rotary clutch controls the entire drive. The shaft drive utilizes a transmission set at rear of drawworks. The inputshaft is driven from the drawworks rotary clutch spider. The outputshaft drives rotary through telescoping shaft equipped with flexible coupling and universal joints. Gear ratios of 1.633:1 or 2.067:1 are available. One reverse and three forward rotary table speeds are provided.
Universal Joints Eliminate Misalignment Problems
Position of Table for Shaft Drive
Position of Table for Chain Drive

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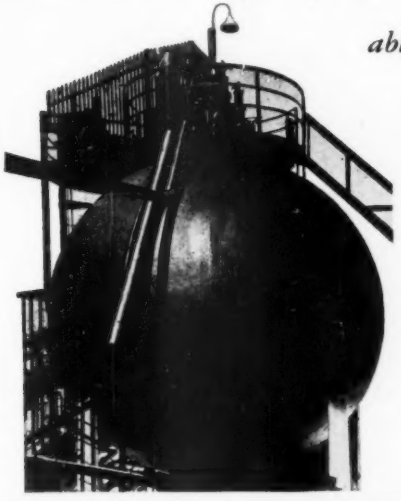
stressing SERVICE

During many years of desalting activity, Petreco has stressed always the importance of fast, effective service. When refiners cite benefits such as more time on stream, lower maintenance costs and increases in refining capacities, we know that such benefits result directly from Petreco's high efficiency salt removal. However, we also believe that the Petreco service organization, whose know-how and experience are unequalled in the industry, is of substantial assistance in providing more profitable refining through more efficient desalting.



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FOR THE BEST IN SERVICE

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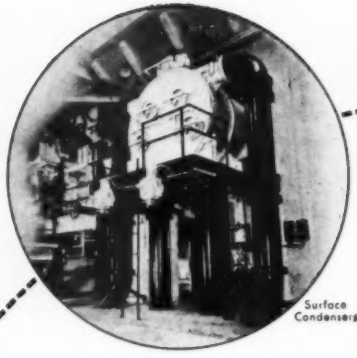
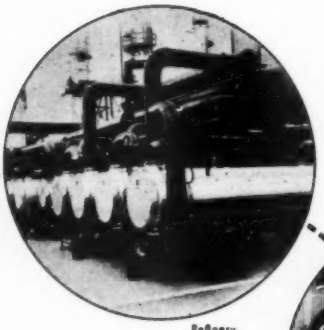
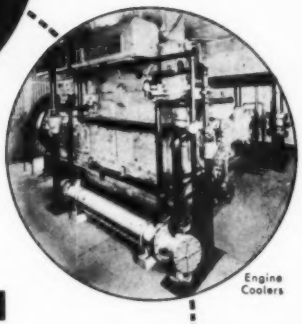


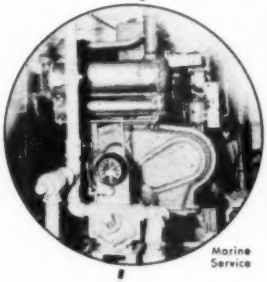
Surface Condensers



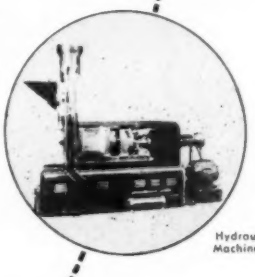
Refinery Exchangers



Engine Coolers



Marine Service



Hydraulic Machinery

For Your Own Use, Or On The Machines You Make To Sell

YOU'LL GET JOB-MATCHED PERFORMANCE FROM THESE STANDARDIZED EXCHANGERS

For a big 27,000 sq. ft. surface condenser down to a little 2-inch oil cooler, Ross standardization today means new highs in job-matched performance and new lows in unit costs.

You may be outfitting a power plant, a petroleum refinery or a chemical plant requiring large capacity heat exchanger equipment . . . or you may be selecting smaller exchangers as accessories for the Diesels, compressors or hydraulic equipment which you use or make for sale to others. Neither the size, nor the type of service, nor the operating conditions present a challenge to Ross standardization . . . for Ross has standardized *successfully* on practically everything that is required in heat exchanger equipment.

This means, naturally, that the time-robbing, cost-mounting aspects of custom fabrication are avoided wherever Ross standardization suffices . . . and it more than suffices in most instances. But, where it doesn't, you still have available the industry-leading experience in special engineering and custom fabrication for which Ross has been known some 30-odd years.

ROSS

EXCHANGERS... *MAKE OTHER PRODUCTS BETTER*

★ **PREVIEW ROSS STANDARDIZATION** by requesting free Bulletin 4300, then review it with a Ross engineer who will gladly consult. ROSS HEATER & MFG. CO. INC., Division of American Radiator & Standard Sanitary Corp., 1417 West Ave., Buffalo 13, N. Y. In Canada, Horton Steel Works, Ltd., Fort Erie, Ont.

Serving home and industry

AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS • DETROIT LUBRICATOR • KEWANEE BOILER • ROSS HEATER • TONAWANDA IRON

"IT WAS LIKE THIS . . . *the deeper we went, the tougher the going — but, the joints held tight and the walls stood up*

— because we were using

NATIONAL SEAMLESS

all the way down!"

ONCE a deep-hole man has worked a well with U·S·S NATIONAL Seamless Drill Pipe, Casing, and Tubing and experienced the *freedom from down-the-hole trouble*, he becomes "sold" for life on these superior oil country goods.

As an example of the kind of dependable service you can expect, consider Stanolind's experience in sinking its No. 1 Briscoe Unit in Grady County, Oklahoma, without a single fishing job! Reports state that there was no time lost and no consequential down-the-hole trouble encountered in running the string of 7" O. D. NATIONAL Seamless Casing to a depth of 13,670 ft. and the string of 2-7/8" O. D. NATIONAL Seamless Tubing to 14,190 ft.

Pierced from solid billets of steel, NATIONAL Seamless Tubular Goods have no welds—no line of potential weakness. Furthermore, they have been improved both in steel composition and physical properties to give them higher collapse resistance and increased joint strength—factors which are of utmost importance in these days of deep drilling. For complete data, write National Tube Company, Frick Building, Pittsburgh, Pennsylvania. Ask for a copy of Bulletin No. 15.

NATIONAL TUBE COMPANY, PITTSBURGH, PA.

UNITED STATES STEEL EXPORT COMPANY, NEW YORK

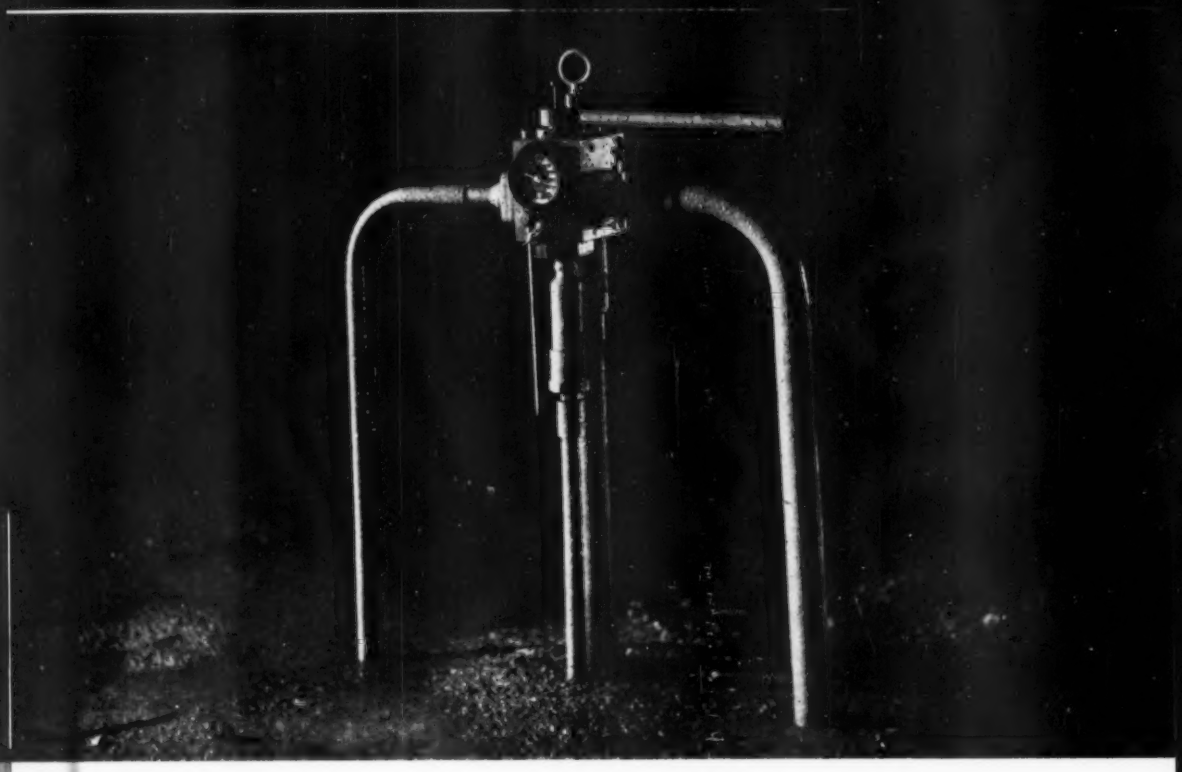
WALLS WITHOUT WELDS

USS

NATIONAL SEAMLESS

drill pipe . . . casing . . . tubing

UNITED STATES STEEL



HOW MUCH IS *Weather* COSTING YOU?

A cost that is seldom entered on the ledger in adding up the expense of lifting oil—is the cost of the weather. Yet it is always there! Rain, sleet, snow, floods—all add to the cost of putting oil into the tanks . . . cost in time . . . cost in production . . . cost in money.

The operators who are today experiencing the lowest possible weather costs are those who are operating Kobe Hydraulic Free Pumping systems.

Free Pump wells keep right on producing regardless of the elements . . . even when the wellhead is completely submerged by flood waters. Controlled from central power plants that can be located for greatest accessibility and protection, Free Pump wells are not subject to weather interference.

In the event that the bottom hole pump in any Free Pump well needs changing, there's no waiting for equipment. No rigging up or tearing down time. So long as one man can reach the wellhead, a new Free Pump can be brought in. One man, alone, can surface, change and run in the bottom hole pump. Your well, regardless of the weather, is off production only the short time it takes to circulate the Free Pump in and out of the well.

Cut your weather costs by changing over to Free Pumping! Know freedom from worry over lost production and downtime! Your local Kobe representative has case histories of the all-weather performance of Free Pumping that will show how you can lower your pumping operating costs.

Free Pump
KOBE
ONE OF THE DRESSER INDUSTRIES

KOBE, INC. *General Offices:* Huntington Park, Calif. *Division and District Offices:* Avenal, Bakersfield and Ventura, Calif.; Rangely, Colo.; Ardmore, Oklahoma City and Tulsa, Okla.; Brownfield, Corpus Christi, Fort Worth, Houston, Longview, Odessa, and Wichita Falls, Texas; Brookhaven, Miss.; Hobbs, N. M.; Great Bend, Kansas; New York City.

THESE ARE THE DAYS OF FREE PUMPING

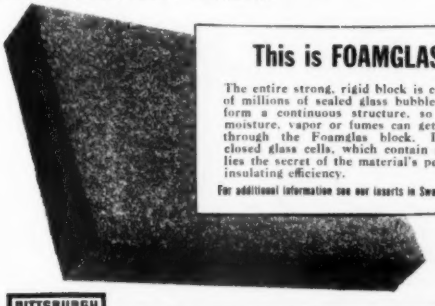
Why PC FOAMGLAS is the permanent industrial insulation

PC Foamglas can be easily cut and formed with ordinary tools, to fit all sorts of irregular shapes. The material is available in preformed sections for all standard pipe sizes and fittings, and in standard blocks, curved segments and beveled lags to fit tank sides, heads, domes and manholes.

PC Foamglas is composed of millions of minute closed cells of air, sealed in glass. They form a continuous structure, through which no moisture, vapor or fumes can pass. The material is fireproof, acidproof, solventproof. So PC Foamglas not only has excellent insulating qualities but also is impervious to elements which cause other materials to lose insulating efficiency.

On tanks, towers, retorts and other large vessels, on hot and cold piping, on heat-exchangers, evaporators and other processing equipment—when installed according to our recommendations and specifications — PC Foamglas retains its original insulating efficiency *permanently*.

Our insulating specialists will be glad to help you work out your individual insulating problems, to show you where and how you can use Foamglas to the best advantage. Meanwhile you will find a lot of helpful information in our recently published booklet on industrial insulation. Why not send the convenient coupon today for a sample of PC Foamglas and your *free* copy?



This is FOAMGLAS®

The entire strong, rigid block is composed of millions of sealed glass bubbles. They form a continuous structure, so no air, moisture, vapor or fumes can get into or through the Foamglas block. In those closed glass cells, which contain still air, lies the secret of the material's permanent insulating efficiency.

For additional information see our inserts in Sweet's Catalogs

Pittsburgh Corning Corporation
Dept. S-109, 307 Fourth Avenue
Pittsburgh 22, Pa.

Without obligation on my part, please send me a sample of Foamglas and your FREE booklet on the use of PC Foamglas for industrial insulation.

Name .....

Address .....

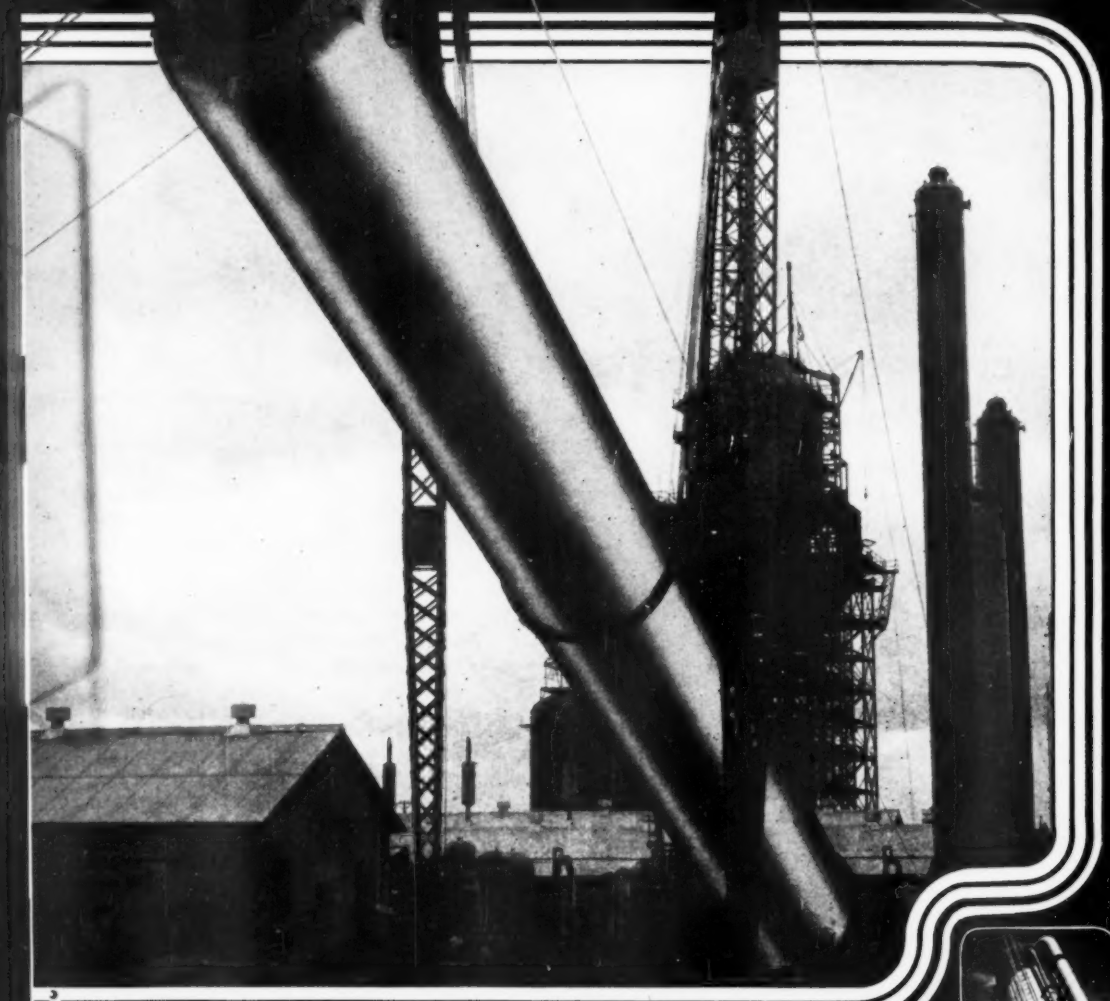
City ..... State .....

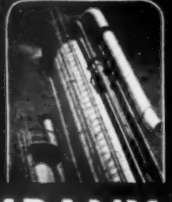
PITTSBURGH PC CORNING ® **FOAMGLAS INSULATION**

...when you insulate with FOAMGLAS... you insulate for good!

Building for Economy of

Natural Resources
Structural Materials
Funds



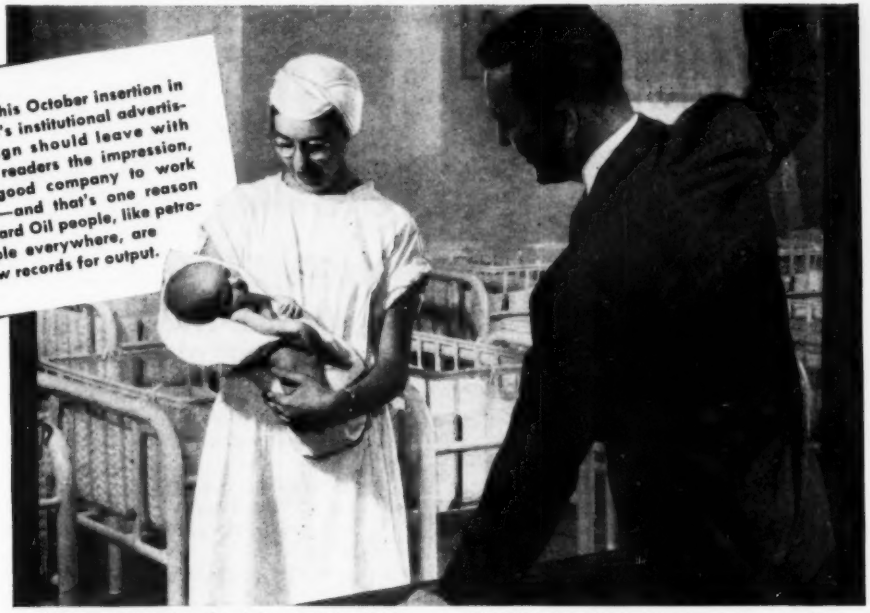


Engineering and Construction Division

JONES & LAUGHLIN SUPPLY COMPANY

TULSA, OKLAHOMA

This October insertion in Standard Oil's institutional advertising campaign should leave with millions of readers the impression, "That's a good company to work for." It is—and that's one reason why Standard Oil people, like petroleum people everywhere, are setting new records for output.



Standard Oil man Charles I. Salmon, who works for us at our Whiting, Indiana, refinery, gets his first look at Kevin C. Salmon. Mr. Salmon's company hospital and surgical operation insurance helped pay the bills. Our employees—and their families—are protected by one of the broadest employee benefit programs in any industry.

IT COSTS DAD LESS TO BECOME A DAD IN THE STANDARD OIL FAMILY

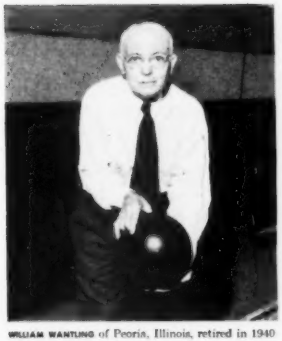
ONE of the things that make Standard Oil a good place to work is the employee benefit program of this company and its subsidiary companies.

This program includes group hospital and surgical operation insurance, covering employees and members of their immediate families. It includes sickness and disability benefits, group life insurance, and vacations. Our employee retirement plan sends monthly checks to retired Standard Oilers.

Every part of this benefit program adds to employee security. So does the fact that every member of the Standard Oil team—drillers, transportation workers, refiners, marketers—has behind him an average investment of $26,700 in tools and equipment—tools which helped him average more than $4,400 in wages and benefits last year.

Most of this equipment was provided by the investment of our 97,000 stockholders. Some of it was provided for by borrowing. Each year we plow back, in new tools and equipment, some of our profits—the money left over after all operating costs are paid. Of Standard Oil's 1948 profits, 29% went to our 97,000 owners; 71% was spent for new tools and equipment.

STANDARD OIL COMPANY (INDIANA)

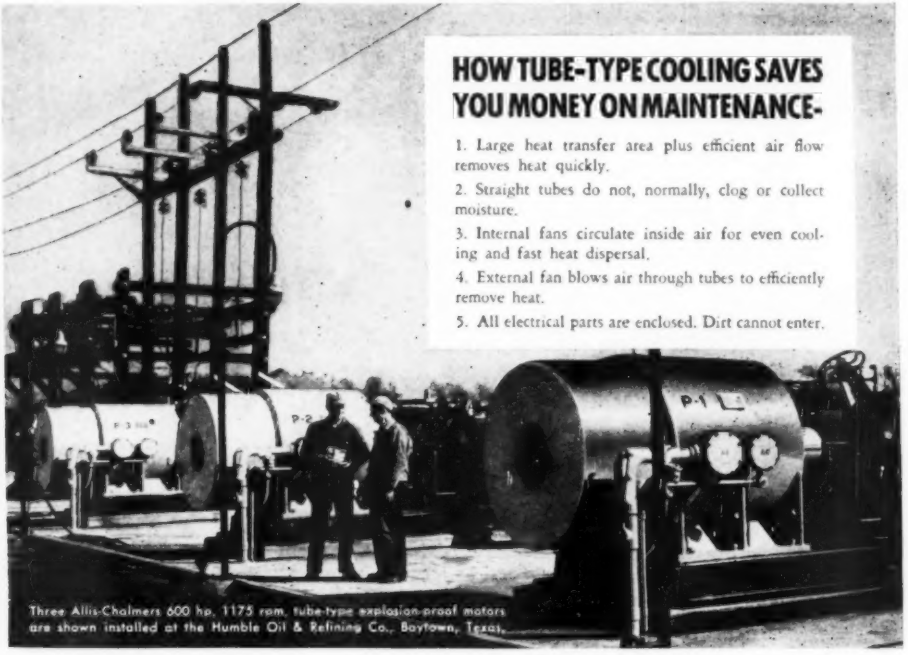


WILLIAM WANTLING of Peoria, Illinois, retired in 1940 after 35 years with Standard. Now he has lots of time for bowling, his favorite recreation. For the rest of his life, he will receive monthly income checks under our employee retirement plan, started in 1903.

ALYCE HEITZMAN'S recent illness sent her to the hospital for 10 days. Thanks to Standard Oil's sickness and disability benefits program, she received full salary payments, plus part of her hospital expenses under our hospital and surgical operation insurance.

STANDARD EMPLOYEES are actually many times safer on the job than they are away from it, according to nation-wide statistical studies covering all types of accidents. Safety is another employee benefit which helps make Standard a good place to work.

New A-C Tube-Type Motors Used By 18 Leading Petroleum Companies!


HOW TUBE-TYPE COOLING SAVES YOU MONEY ON MAINTENANCE-
1. Large heat transfer area plus efficient air flow removes heat quickly.
2. Straight tubes do not, normally, clog or collect moisture.
3. Internal fans circulate inside air for even cooling and fast heat dispersal.
4. External fan blows air through tubes to efficiently remove heat.
5. All electrical parts are enclosed. Dirt cannot enter.
P-1
P-2
P-3
Three Allis-Chalmers 600 hp, 1175 rpm, tube-type explosion-proof motors are shown installed at the Humble Oil & Refining Co., Baytown, Texas.

OVER ONE THIRD of Allis-Chalmers tube-type, explosion-proof motors have been purchased by 18 of the world's leading petroleum companies! . . . Proof that petroleum operators want these important features:

1. APPROVED BY UNDERWRITERS' LABORATORIES for ratings to *450 hp at 3600 rpm.* Motors of similar design are offered in larger sizes. This new, tube-type motor is the simplest explosion-proof design now offered in the very large sizes.

2. MOTOR IS SELF-CLEANING because of straight flow of cooling air — avoiding hidden recesses encountered in usual designs. If unusual operating conditions make cleaning desirable, motors can be cleaned while in operation — simple as cleaning your shotgun with a ramrod!

3. QUIET OPERATION because of improved fan design . . . straight flow of cooling air . . . smaller quantity of cooling air required by effective radiation system.

4. LIGHTER WEIGHT, YET MORE EFFICIENT! Elimination of heavy shell castings reduces motor weight . . . no sacrifice of electrical performance.

You'll want more information on how this *new* motor can help save maintenance dollars! Send for Bulletin 51R7149.

ALLIS-CHALMERS, 1059A SO. 70 ST.
MILWAUKEE, WIS.

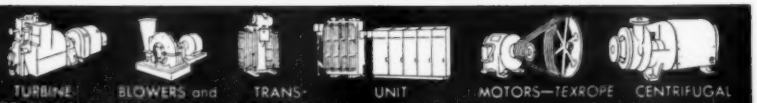
Texrope is an Allis-Chalmers trademark.

A-C ALLIS-CHALMERS

ALLIS-CHALMERS

A-2788

Power, Electrical, Processing Equipment for Petroleum Industry



REFINERS RELY ON McKEE...

FOR SOUND DESIGN

Hundreds of successfully operating McKee-designed refineries all over the world prove the value of McKee design.

FOR EFFICIENT ENGINEERING

McKee's long experience and closely coordinated organization of well-qualified specialists assure the refiner efficient, economical engineering and procurement.

FOR PROMPT, ECONOMICAL CONSTRUCTION

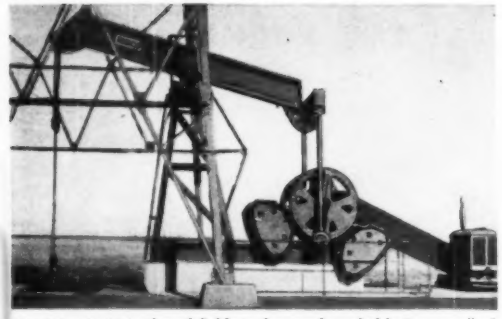
McKee recognizes the importance of prompt, economical execution of contracts to transform capital investment into profitably operating plant in the shortest possible time.

ARTHUR G. McKEE & COMPANY

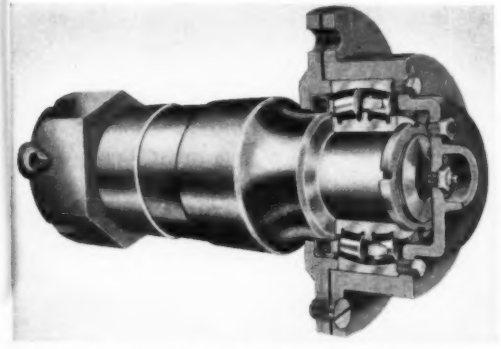
DESIGN, ENGINEERING AND CONSTRUCTION FOR THE PETROLEUM REFINING AND IRON AND STEEL INDUSTRIES

ENGINEERS AND CONTRACTORS • ESTABLISHED 1905
2300 CHESTER AVENUE, CLEVELAND
30 Rockefeller Plaza, New York, N. Y.

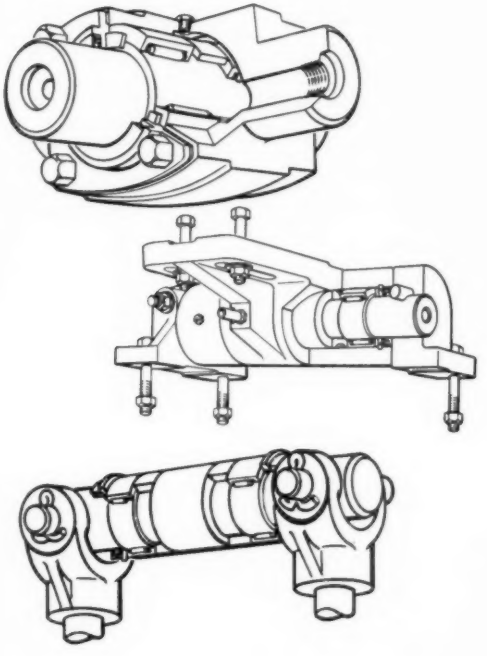
Torrington Bearings give years of trouble-free service in IDECO geared pumpers



Familiar Sight in the oil fields is the steady, reliable "see-saw" of geared pumpers built by International Derrick and Equipment Co. Units built 21 years ago are still on the job. They have been made reliable by such features as Torrington Bearings in many critical applications.



The Wrist Pin Assembly is a typical example. By incorporating a Torrington Spherical Roller Bearing, self-alignment becomes completely automatic. Deflection of the pitman in operation is also accommodated, and bearing cramping is avoided.



These Drawings illustrate the application of Torrington Type NCS Needle Bearings to IDECO equalizer, beam center and rein hanger assemblies. Several features of this bearing have led to its preference. Tremendous radial capacity is provided by its full complement of rollers. It operates directly on a hardened and ground shaft, making an unusually compact and economical assembly. Small diameter rollers assure even distribution of lubricant to all bearing surfaces, despite the difficult conditions of oscillating service.

Torrington Bearings have demonstrated their dependability by providing years of trouble-free service in all types of oil field equipment. Let our engineers help you secure the advantages of efficient operation and low maintenance assured by Torrington Bearings. Write us today. THE TORRINGTON COMPANY, South Bend 21, Ind., or Torrington, Conn. District offices and distributors in principal cities of United States and Canada.

TORRINGTON *SPHERICAL ROLLER* **BEARINGS**

Spherical Roller • Tapered Roller • Straight Roller

Needle • Ball • Needle Rollers

THEY REPLACE EVERY TIME

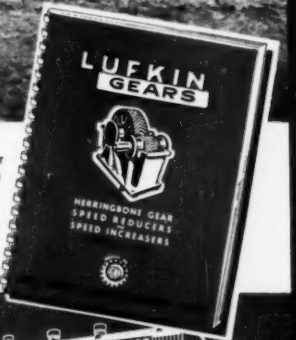
WITH THE

Lufkin Line

Typical is this picture of the replacement of an old "Standard" rig with a modern, efficient, economical LUFKIN PUMPING UNIT.

In this day of "price slides" the demand for economy in all departments calls for the replacement of old inefficient equipment with that offering the greatest in operating and maintenance costs.

Write, phone or wire our nearest representative.



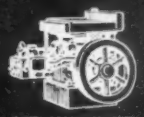
LUFKIN FOUNDRY & MACHINE COMPANY

LUFKIN, TEXAS

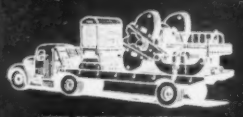
Branch sales and service Houston, Dallas, New York, Tulsa, Los Angeles, Seminole, Oklahoma City, Corpus Christi, Odessa, Kilgore, Wichita Falls, Casper, Wyoming; Great Bend, Kansas.

More than 60,000 complete gear reducers and increasers have been manufactured in our Lufkin plant. The complete line specifications are contained in Catalog G-1. Write for your copy today. No obligation whatsoever!

LUFKIN



LUFKIN-COOPER-BESSEMER

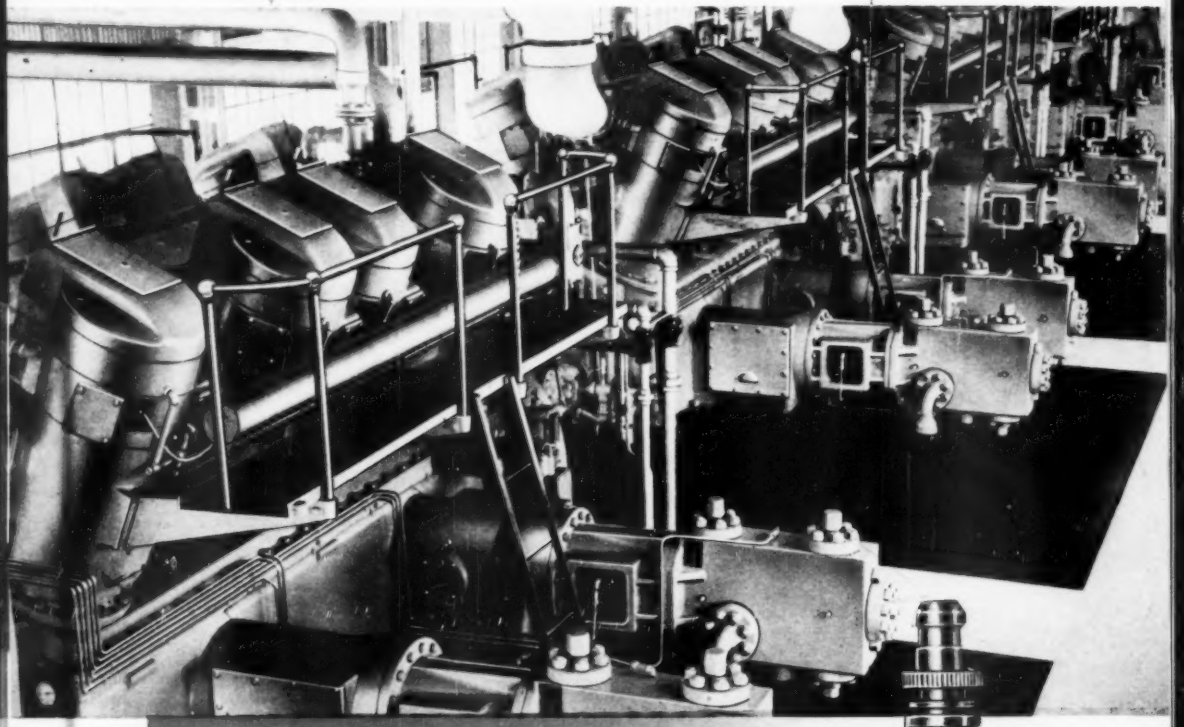


LUFKIN OIL FIELD AND INDUSTRIAL

INDUSTRIAL SPEED REDUCERS

DIVISION LUFKIN FOUNDRY & MACHINE COMPANY

Continuous, Dependable Operation



NINE INGERSOLL-RAND (Type 8KVG) gas engine driven compressors in use at the world's largest cycling plant, the Katy Plant of Humble Oil & Refining Company at Katy, Texas.

THE 72 CYLINDERS OF THE ENGINES driving these compressors develop 7,200 H.P. and rely on 72 BG RB212-2 Spark Plugs for 24-hour-a-day, dependable operation.

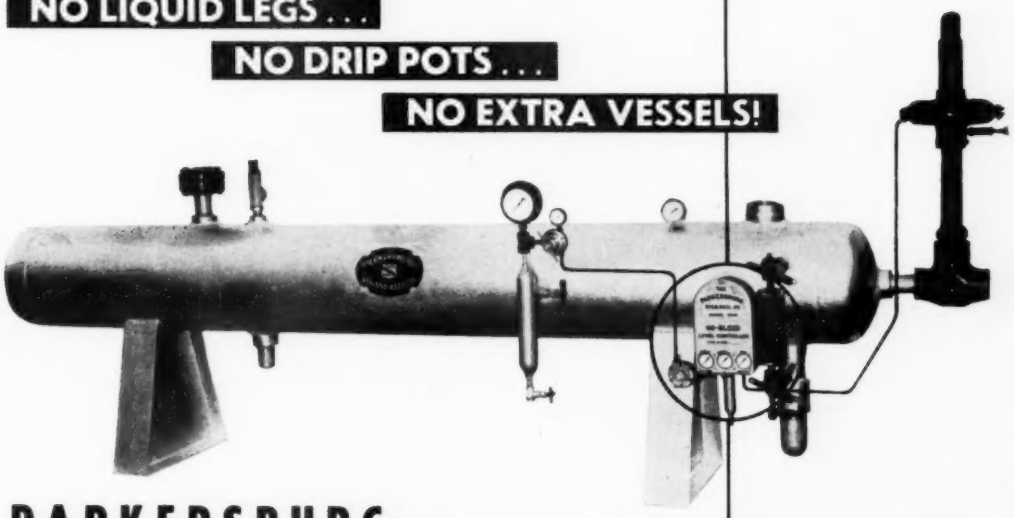
THE BG CORPORATION

NEW YORK 19, N. Y.

NO LIQUID LEGS . . .

NO DRIP POTS . . .

NO EXTRA VESSELS!



PARKERSBURG *HORIZONTAL* SEPARATORS

Here is the industry's newest and most advanced horizontal separator. Without the use of, or need for, such auxiliary attachments as liquid legs, drip pots, extra vessels, the Parkersburg Horizontal Separator is a completely self-contained, single shell unit that provides more efficient separation . . . more thorough drying of gas . . . handles large volume . . . requires practically no service or maintenance.

Practically all of the area within the extra large, single shell is utilized for the extraction and drying of gas . . . making any additional vessels unnecessary. This compact, lighter unit is easier to install, more conveniently and simply skid mounted in single units or for multiple stage separation.

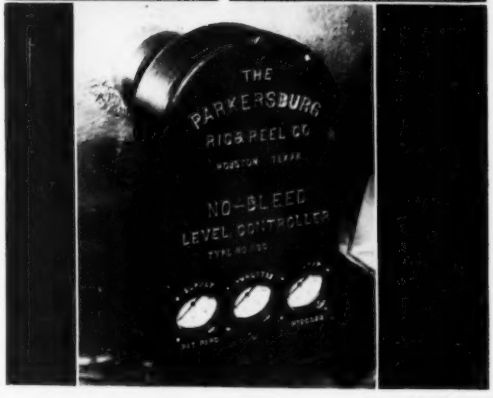
The hair trigger sensitivity and precision control of the No-Bleed Liquid Lever Controller eliminates the need for supplemental vessels for the attachment of level control equipment. Because it operates in a very close range, controls the liquid within a small fraction of an inch and requires but a few inches of fluid for the float, the No-Bleed Liquid Level Controller is mounted directly on the separator.

It will pay you to get full details about this most advanced of all horizontal separators. Ask your nearest Parkersburg Representative, TODAY, or write to

THE PARKERSBURG RIG & REEL CO.

PARKERSBURG, WEST VIRGINIA

. . . thanks to Parkersburg's **exclusive** extra large shell size and No-Bleed Liquid Level Controller



AD NO. 4910

PARKERSBURG

MAGCOGEL BENTONITE

QUALITY CONTROLLED FROM MINE PIT TO MUD PIT . . .

Mined and processed by people who know and "live" mud, Magcogel Bentonite is made from carefully selected high gel type colloidal Wyoming bentonite. Deposits are core drilled and laboratory tested prior to mining so that only the type of material best suited for drilling mud use is tagged for Magcogel. After mining, Magcogel Bentonite is stock piled to insure uniformity. Every step is under rigid laboratory control.

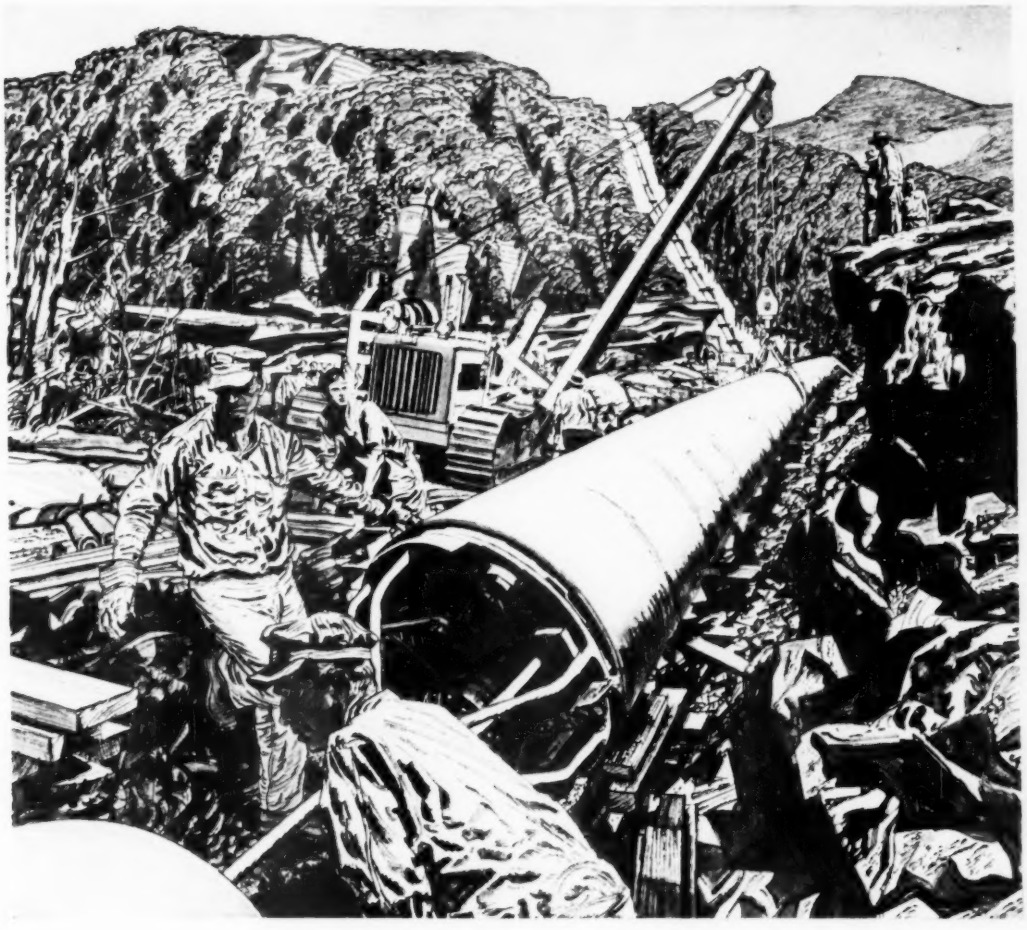
Magcogel Bentonite . . . a concentrated colloidal additive for preparing and conditioning drilling mud . . . is economical to use because so little is needed. Look for the Magcobar sign when you need mud. More than 250 Magcobar dealers are ready with adequate stocks of Magcogel Bentonite to meet your drilling mud needs.

MAGNET COVE BARIUM CORPORATION
MALVERN, ARK. HOUSTON, TEXAS

Look for this sign **WHEN YOU NEED MUD**

MAGCOBAR • MAGCOGEL • HIGH YIELD DRILLING MUD • XACT CLAY • FIBER-SEAL • MAGCO-MICA • TANNATHIN • JEL-OIL MUD • JEL-OIL "E" • SALT GEL NOHEEV • SEAL FLAKES • MY-LO-JEL • CHEMICALS

Magcobar
Complete
DRILLING MUD SERVICE
DEALER



Pipeline Men Call it
THE TOUGHEST INCH

The Big Inch and Little Big Inch are much longer. Other pipelines have more "inches" of diameter. But none has been tougher to build than the Columbia Gas System's "Toughest Inch". Rugged men and massive machinery are fighting the mountains and rocks and rivers of West Virginia to lay this giant steel tube from near Charleston, W. Va., to Rockville, Maryland.

The results will be well worth the battle.

When completed next year, this line will help meet the increasing demands for natural gas in the nation's capital. In Baltimore, more than a quarter million families will gain for the first time the advantages of the cleanest, most convenient, most economical of all standard fuels.

This is a rugged project. But it is typical of American engineering, continually working to advance the country's living standards. The Toughest Inch is a typical Columbia Gas System effort, too—characteristic of the natural gas industry's desire to serve more people with more of nature's best and most wanted fuel.

This year, The Columbia Gas System, Inc., Columbia Engineering Corporation and 18 operating subsidiaries will distribute more than 250 billion cubic feet of gas to customers in seven states and the District of Columbia.

The Columbia Gas System, Inc.

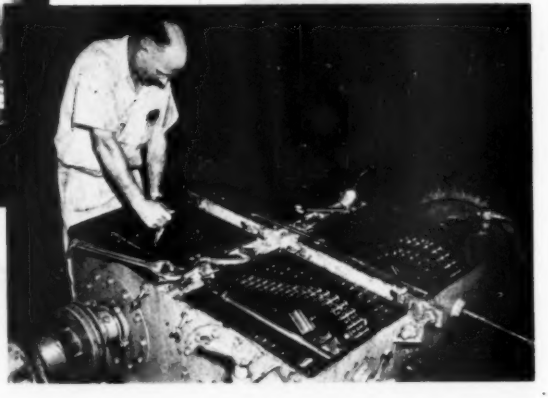
120 East 41st Street, New York 17, N. Y.

"I've Sold and Serviced Wilson Rigs and Winches Over 15 Years--THEY'RE THE BEST!"

In 15 years of serving the drilling industry, Jack Anderson, Jack Anderson Engine Co., Kilgore, Texas, has sold over 500 Wilson Rigs and Winches. A family man himself, with a daughter in college, Jack is a member of the nationwide family of dependable Wilson dealers.

Wilson Manufacturing Company has been built on a personal, reliable service. Today you'll find factory trained service representatives, parts and service depots, sales representatives, and factory trained mechanics at your service wherever you are. This complete, nationwide service is another plus advantage when you buy a Wilson Rig or Winch.

Above: A. E. Gazette, *Partsman*, servicing another satisfied Wilson customer.



At Right: H. H. Holt, *Mechanic*, overhauling a Rig transmission. In East Texas, Jack Anderson has made many happy Wilson users with his trade-in program.

Wilson Manufacturing Co. INC.
WICHITA FALLS, TEXAS

At Right: Jack Anderson's organization. Back row, left to right: F. E. Brown, L. D. Propes, A. J. Pittinger, L. B. Damuth. Middle row, left to right: G. F. Hancock, A. W. Duke, A. E. Gazette, A. H. Grush, W. R. Lawrence, Mrs. Thelma Perkins, Mrs. Bobirose Stephenson, Miss Perri Dillahunty, Mrs. Edith Gordy, J. C. Anderson, J. A. Woods, H. H. Holt. Front row, left to right: Hollis Montgomery, David Miles, Willie Williams.

Below: You'll find Wilson Rigs, Winches, and parts in stock; repair shop and plenty of prompt service at Jack Anderson's Engine Company at Kilgore, Texas.

Below: Jack Anderson stands beside a new Wilson Mogul Torcair Rig, ready for delivery.

Exclusive Distributor, Sales, Parts, Service

Power Rig & Equipment Co., 5141 Anaheim-Telegraph Road, Los Angeles, California. Phone Angelus-33851.

Power Rig & Equipment Co., Bakersfield, California. Phone 22942 or 28940.

Export Sales Representatives

Daniels, Beckley and Associates, 30 Rockefeller Plaza, New York. Phone Plaza 7-3270.

Langley y Cia, Corrientes 1115, Buenos Aires, Argentina, TA-35, Libertad 9535.

Sales and Service Dealer for France and the French Colonies

Dufour Pere, Fils & Cie, 11, Rue Aspirant Dargent, Levallois-Perret (Seine), France.

Sales Dealer for Germany, Austria, and Yugoslavia

Lindquist et Cie, 10, Rue Auber, Paris IX, France.

Parts Depots

Mid-Continent Supply Co., Odessa, Texas. Phone 522 and L.D. 7.

Mid-Continent Supply Co., Laurel, Miss. Phone 1434.

Mid-Continent Supply Co., Brookhaven, Miss. Phone 1138.

Houston Oil Field Machinery Co., Houma, Louisiana.

Mid-Continent Supply Co., New Iberia, La. Phone 2061-J.

Jones & Laughlin Supply Co., Salem, Ill. Phone 370.

Factory Service Representatives

D. E. Miles, Service Manager, Wichita Falls, Texas. Phone L.D. 11, 2-2154 or 4071.

John Gray, Wichita Falls, Texas. Phone 2-0884.

B. O. Keller, Wichita Falls, Texas. Phone 2-9014.

J. J. Patton, Wichita Falls, Texas. Phone 2-4051.

Roman Bartosh, Wichita Falls, Texas. Phone 2-4865.

C. F. Davidson, 703 Chestnut St., Duncan, Okla. Phone 491-W.

L. D. Gregory, Odessa, Texas. Phone 2943, 9161 or L.D. 18.

L. N. Gregory, Box 767, Kermit, Texas. Phone 44, or 630-J, Pecos, Texas.

D. H. Gregory, Houma, La. Phone 1033-R.

H. T. Berndt, 4821 Blundell, Corpus Christi, Texas. Phone 4-0331.

Ed. W. Smithson, Great Bend, Kansas. Phone 5447.

L. A. Gosden, Box 474, Carmi, Ill. Phone 86.

Factory Branch Parts Depots and Service Dealers—Factory Trained Service Representatives

Jack Anderson Engine Co., Kilgore, Texas. Phone 7.

Empire Machinery Co., Ltd., Odessa, Texas. Phone 9161 or L.D. 18.

Dixie Iron Works, 70 Kentucky St., Alice, Texas. Phone 1466-7.

Gehring Equipment Co., 1701 Yellowstone Ave., Casper, Wyo. Phone 4170.

C & W Machine Works, Great Bend, Kansas. Phone 5437.

George W. Blandin Co., 1106 7th St., Wichita Falls, Texas. Phone 8700.

Ray R. Funston, Iowa Park Rd., Wichita Falls, Texas. Phone 2-5203.

L & H Machine Works, 2205 Quitman St., Houston, Texas. Phone Charter 4-2581.

Superior Iron Works & Supply Co., 1202 Marshall St., Shreveport, La., Box 108. Phone 3-1611.

Federal Supply & Machinery Co., Winfield, Kansas. Phone 488.

John C. Burge, Inc., 2800 South High St., Oklahoma City, Okla. Phone 62-5515.

Tipps Tool Co., Laurel, Miss.

Northwest Industries, Ltd., P. O. Box 517, Edmonton, Alberta, Canada. Phone 27141.

Spicer
ENGINEERING
Solves the Problem

Spicer's 45 years' of experience in automotive power transmission engineering pays off in many ways. The SKY-HOOK is a typical example. It is a specially designed aerial vehicle for hauling heavy logs out of rough terrain where there are no roads or usual means of getting out timber. A motor-actuated drum at each end winds up the cable and pulls the vehicle in either direction along the trolley wires. When a change of location is desired, the SKY-HOOK is put on rubber-tired wheels and transported like a trailer. Three sets of Spicer Universal Joints, and one Spicer Brown-Lipe Auxiliary Transmission with top-mounted power take-off, help the SKY-HOOK snake 'em out with speed and economy!

SPICER ENGINEERING is available for the development and application of sound power transmission principles to all automotive needs.

The Spicer-Equipped SKY-HOOK is made by the Pointer-Williamette Company of Portland, Ore., manufacturers of trailers and special rigs.

SPICER ENGINEERING produces Transmissions, Passenger Car Axles, Clutches, Parish Frames, Torque Converters, Stampings, Forgings, Universal Joints, Propeller Shafts, Spicer "Brown-Lipe" Gear Boxes, Railway Generator Drives.

Designing, Developing, Engineering, Manufacturing and Service

45 YEARS OF Spicer SERVICE

SPICER MANUFACTURING
Division of Dana Corporation
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WE NOW SERVE YOU FROM THESE POINTS

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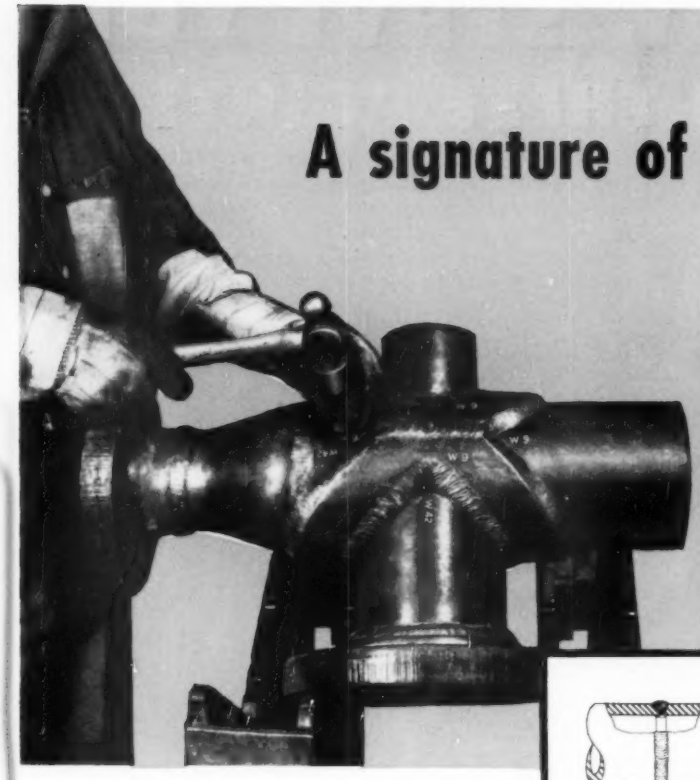
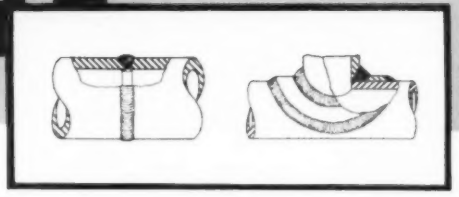
5702 NAVIGATION BLVD. HOUSTON, TEXAS

M. O. JOHNSTON OIL FIELD SERVICE CO.
Servicing California & Rocky Mountains

A signature of quality



every weld on a Grinnell prefabricated piping job is made by a *qualified* welder



You're looking at a man whose "signature" assures quality welding of piping. He's a Grinnell welder and, as every Grinnell welder, he is qualified by Grinnell according to a procedure which conforms to A.S.M.E. Boiler Construction Code, Section 9. After qualifying, he is given a number which he "signs" adjacent to each weld he makes.

Quality welding is only one of a long chain of responsibilities assumed by Grinnell on every prefabricated piping job . . . from the interpretive engineering to the on-time delivery of the fabricated piping. Such responsibility requires facilities for metallurgical research and testing, comprehensive knowledge of state laws and industry codes, and a complete familiarity with insurance company requirements for fabricated piping.

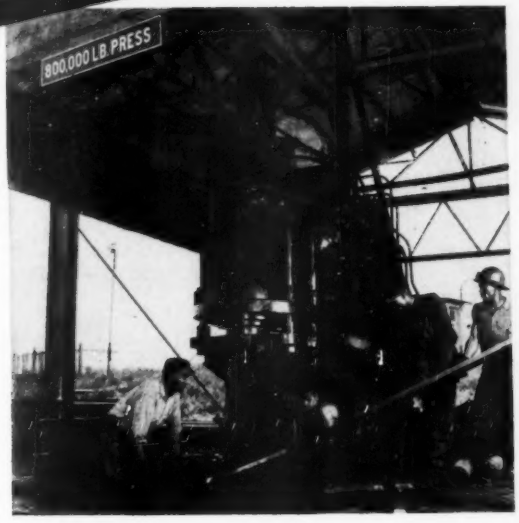
The fabrication of piping for today's high pressure, high temperature or corrosive services is a job for experts. It's a job for Grinnell prefabricating plants because Grinnell has the modern equipment and methods, and the skilled personnel which enable them to assume total responsibility for the job.

GRINNELL

Grinnell Company, Inc., Providence, Rhode Island. Branches: Atlanta • Buffalo • Charlotte • Chicago • Cleveland • Cranston • Fresno • Kansas City • Houston Long Beach • Los Angeles • Milwaukee • Minneapolis • New York • Oakland • Philadelphia • Sacramento • St. Louis • St. Paul • San Francisco • Seattle • Spokane

AVONDALE

has the tools...



TO SAVE YOU MONEY ON MARINE REPAIRS

You, IN THE OIL INDUSTRY, know the importance of the right tools for the right job! It is the same with marine repairs—the right tools for the job can save more time and more money. Take, for instance the 800,000 lb. press shown above. . . . AVONDALE'S other special tools include rollers, plate brakers, lathes and many others. These, plus AVONDALE'S 24-hour machine shop service, can save YOU money on all types of marine repairs—no matter how large or how small. Call AVONDALE, consult our experts—get our estimate on your job.

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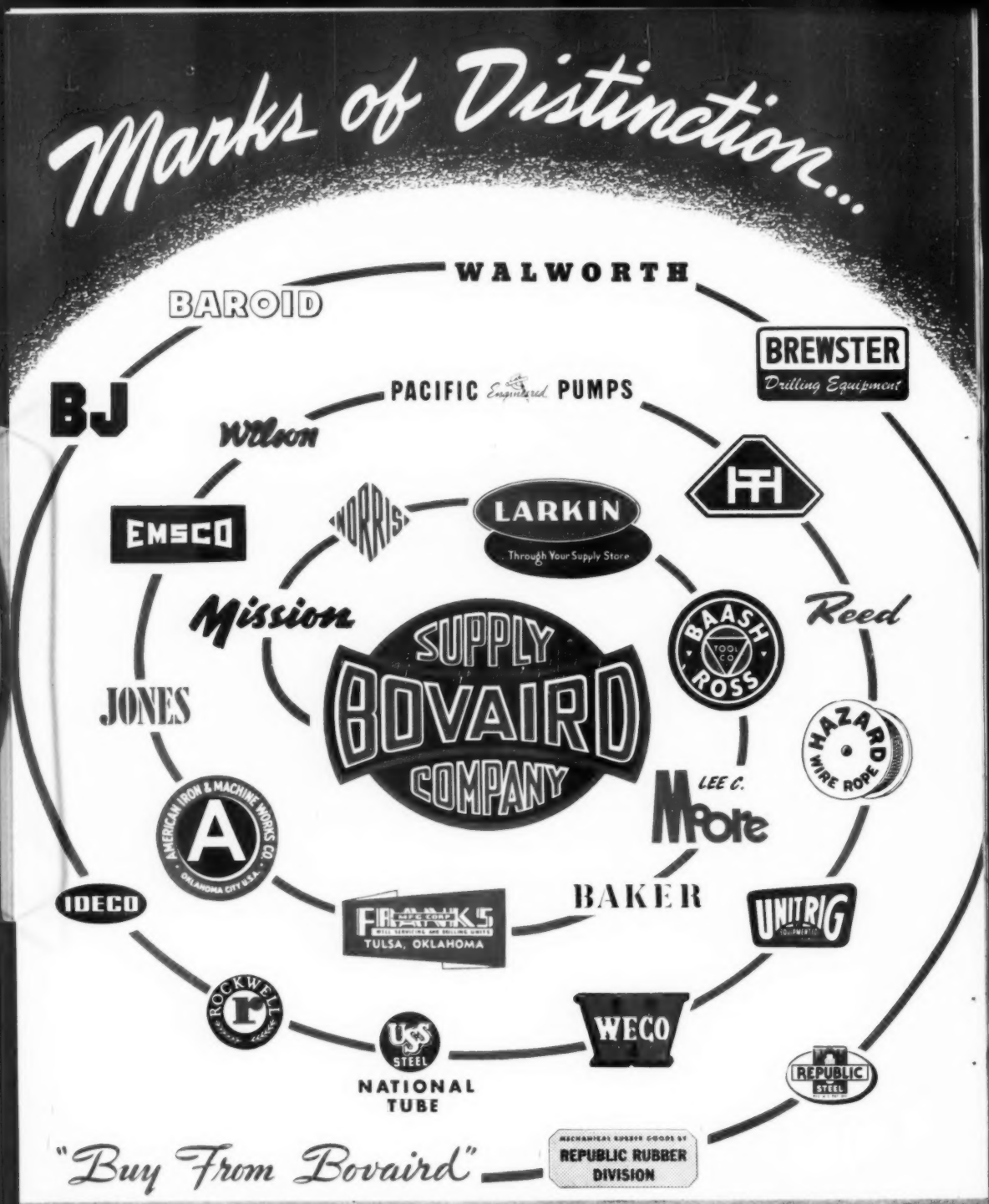
RIVER FRONT, NEW ORLEANS DISTRICT
MAILING ADDRESS: WESTWEGO, LOUISIANA

MAIN PLANT: AVONDALE, LA.
QUICK REPAIR PLANT — HARVEY, LA.



THE BOVAIRD SUPPLY CO.

GENERAL OFFICES: TULSA, OKLAHOMA

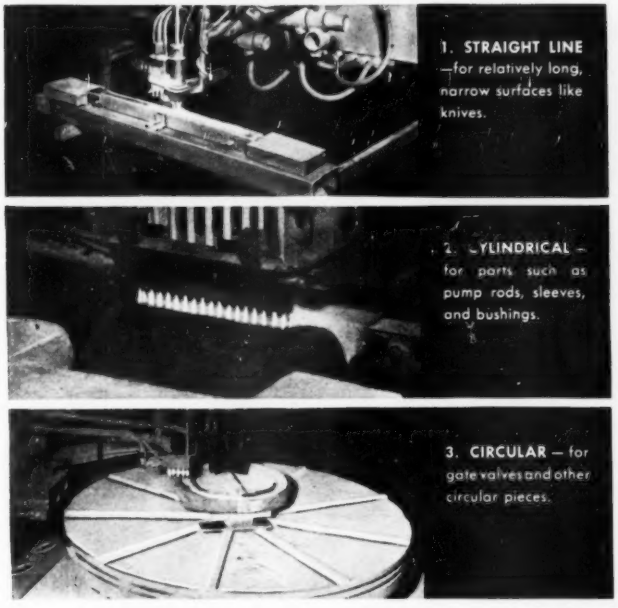
Mechanized Hard-Facing

for surfacing parts faster, more economically

Advantages over Manual Methods

- Up to 4 times faster
- Smoother, more uniform deposits
- Less rod required per piece surfaced
- Finishing time reduced

Three Mechanized Hard-Facing Methods



1. STRAIGHT LINE —for relatively long, narrow surfaces like knives.

2. CYLINDRICAL — for parts such as pump rods, sleeves, and bushings.

3. CIRCULAR — for gate valves and other circular pieces.

Mechanized hard-facing is a new and economical process developed by Haynes Stellite Company for applying a protective surface to wearing parts on a production basis. With a mechanized setup, parts can be surfaced up to four times faster than by manual methods. In addition, less hard-facing material is required per piece surfaced. The deposits produced are smooth and uniform, and therefore require less finishing time.

For full information on mechanized hard-facing, write to Haynes Stellite Company, Kokomo, Indiana. If you want help in determining whether any job in your shop should be mechanized, ask to have a service engineer call.

HAYNES TRADE-MARK *alloys*

"he registered trade-mark, "Haynes," distinguishes products of Haynes Stellite Company.

Haynes Stellite Company

Unit of Union Carbide and Carbon Corporation

UCC

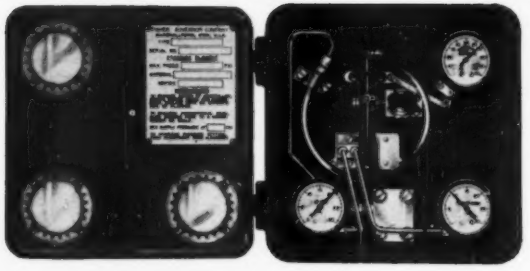
General Offices and Works, Kokomo, Indiana

Sales Offices

Chicago—Cleveland—Detroit—Houston

Los Angeles—New York—San Francisco—Tulsa

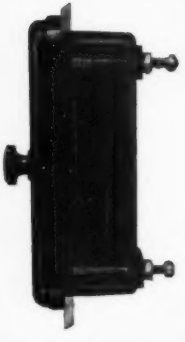
Your Favorite Dependable WIZARD...in a new gas-tight weather-proof case for flush or surface panel mounting



Type 4100U remote mounting Wizard with cover open.

FISHER WIZARD PILOT

SERIES 4100U



Side view Type 4100U for flush mounting.

Side view Type 4100U for surface mounting.

Universal case adapts Wizard to flush or surface panel mounting and also to valve yoke mounting.

Available with either bellows or Bourdon tube measuring element, for pressures from inches W. C. to 10,000 PSI.

Simple knob adjustment for controlled pressure setting, indicated on calibrated dial.

WRITE TODAY FOR BULLETIN D4

FISHER GOVERNOR CO.
MARSHALLTOWN, IOWA

THE CABLE TOOL RIG established the American petroleum industry as a going concern. While its operation required more art than science, it tapped vast oil reserves and even today holds its own against the rotary in many localities. Baroid takes pride in its association with an industry which has risen so high from such humble beginnings.

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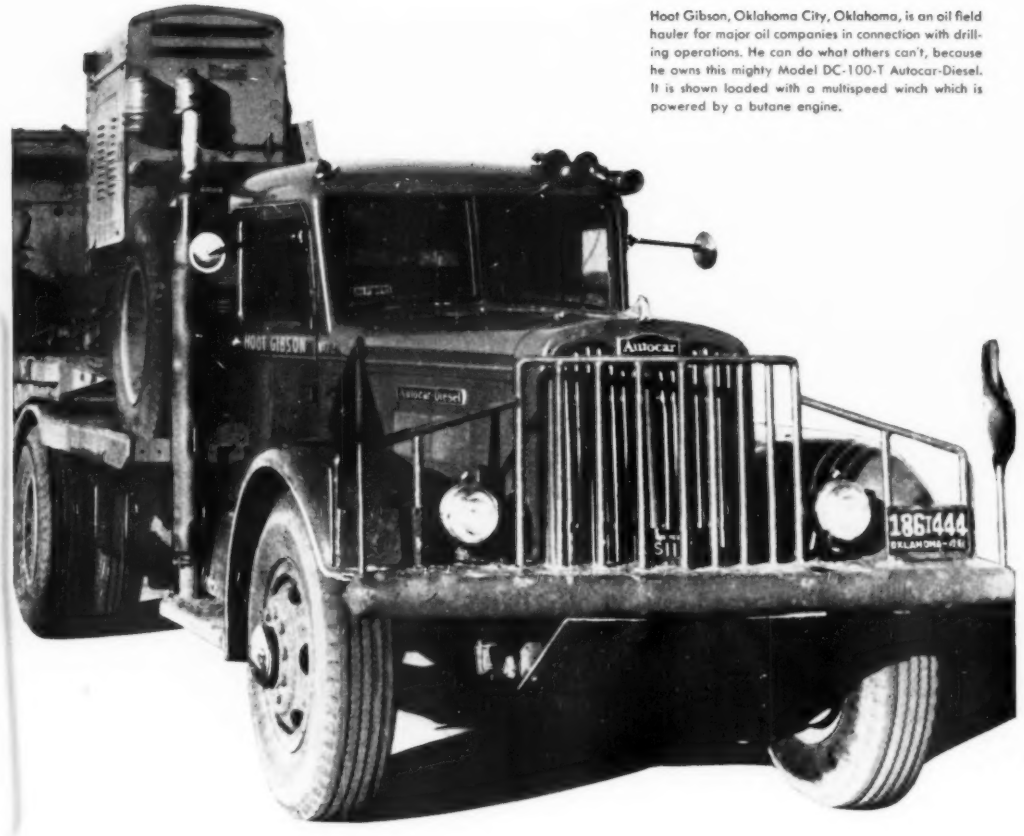
Third of a series of historical paintings • Art prints ready for framing may be obtained from Baroid Sales Division, P. O. Box 2550, Terminal Annex, Los Angeles 54, California

Meet competition with Autocars



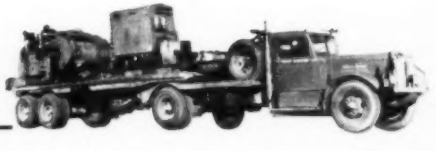
Hoot Gibson, Oklahoma City, Oklahoma, is an oil field hauler for major oil companies in connection with drilling operations. He can do what others can't, because he owns this mighty Model DC-100-T Autocar-Diesel. It is shown loaded with a multispeed winch which is powered by a butane engine.

There's no time like the present to prove that the best equipment gives the best results. Competition-wise, the Autocar owner is sitting pretty. With his heavy-duty Autocars, he can deliver more, faster, and at lower cost.

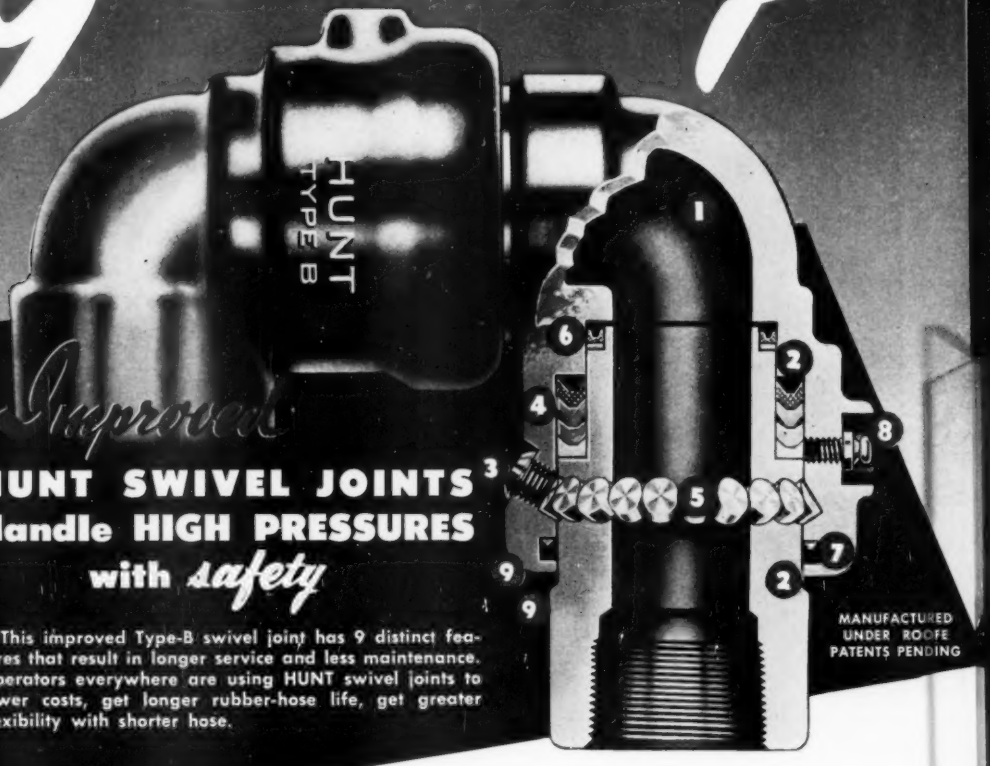
AUTOCAR TRUCKS

They cost less, because they do more work

Manufactured in Ardmore, Pa.
Factory Branches and Distributors from Coast to Coast



9 Reasons Why...



Improved

HUNT SWIVEL JOINTS Handle HIGH PRESSURES with *safety*

This improved Type-B swivel joint has 9 distinct features that result in longer service and less maintenance. Operators everywhere are using HUNT swivel joints to lower costs, get longer rubber-hose life, get greater flexibility with shorter hose.

MANUFACTURED UNDER ROOFE PATENTS PENDING

1. *Full-size streamlined bore* . . . assures smoother flow of fluids, less abrasive wear
2. *Longer bearing length* . . . maintains perfect alignment of all working parts, less torque in turning
3. *Removable loading plug* . . . simplifies maintenance without adjustment, easier access to bearings
4. *Chevron-type packing* . . . provides longer service, easier repacking
5. *Greater roller-bearing contact areas* . . . greater safety against thrust and shock loads, easier turning
6. *Stronger end-seal* . . . packing prevents abrasion from fluid turbulence
7. *Better grease seal* . . . assures better lubrication, better sealing against leaks
8. *Handy grease fitting* . . . Zerk or Alemite . . . easier lubrication under working pressure
9. *Highest grade alloy steel bodies* . . . added safety under high tempeatures, high working pressures

That's why operators everywhere are specifying HUNT swivel joints for handling high pressures with safety. Write today for illustrated folder.

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A BUSINESS BUILT ON *Good* SERVICE

Big NON-ECCENTRIC *Precision Bearings ...that's what* KAYDON *stands for!*

Eccentricity in the bearing shown above was held within **.0002"*** ("practically unheard of" precision for bearings of this size).

Such accuracy doesn't just "happen". It's the result of **KAYDON**'s development of all the required facilities, within this one organization, for producing all the types and sizes of bearings listed below. These unique facilities are fortified by engineering know-how and broad experience in solving difficult bearing problems. **KAYDON** has its own modern atmospheric controlled heat treating, hardening with sub-zero conditioning, precision heat treating, metallurgical laboratory, microscopy and physical testing facilities.

Unbiased as to any one type of bearing design, **KAYDON** always is in position to recommend the one best suited to your specific use.

Counsel in confidence with **KAYDON**.

**Ground on Frauenthal Precision Grinder*

KAYDON Types of Standard or Special Bearings: Spherical Roller • Taper Roller • Ball Radial • Ball Thrust • Roller Radial • Roller Thrust

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• ALL TYPES OF BALL AND ROLLER BEARINGS 4" BORE TO 120" OUTSIDE DIAMETER •

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TO REMEMBER

DAY or NIGHT

You can recognize Brewster Service Department trucks on sight, by the prominent black lines on the top of every cab. These are Service Stripes—for they show that a trained, experienced Brewster Service Man is on the job, or on his way, to service and repair Brewster rigs anywhere in the U. S., or any make drilling rig in the Mid-Continent Area. Night or day, Brewster Service Men are prepared to leave for your location by truck—or by air if necessary. When your operations are threatened with delay because of breakdowns, or the need for replacement parts, call the Brewster Service Department for fast, expert service and repair. Write today for your copy of the folder describing the facilities of the Brewster Service Department.

TEAR OUT the Card below and KEEP IT HANDY!

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TRADE MARK ®

Tuffy Slings

TRADE MARK ®

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Tuffy Slings are made of a unique 9 part fabric, so flexible you can tie it into a knot without material damage. Each strand interlaced. No core to pop out. The fabric is woven by machine method originated by Union Wire Rope. This machine fabrication eliminates the inequalities of hand making and provides uniform strength throughout the length of every Tuffy sling. The construction makes possible the forming of eyes which average 95% the strength of the fabric.

Delivered as a Complete Package With Choice of 10 Types of Fittings

Tuffy Slings are ready to go to work for you the moment you get them. Every Tuffy Sling is complete in itself, with the type of fitting you need for the job to be done. Choice of ten types of fittings and all sizes of slings from 3/8" to 1½". Special fittings also available on order.

Built to Wear Longer on Tough Jobs

Every Tuffy Sling is proof-tested to twice the safe working load. Metal tags on the slings give their safe working load limits on straight pulls. When it's a tough job—Tuffy slings are ready to hitch on to it.

Send for New Folder Giving Complete Facts

UNION WIRE ROPE CORP

union Wire Rope

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UNION *Wire Rope* warehouses

Every Well Driller Should Have This Booklet ...It's Free For The Asking

For Cable Tool, Rotary or Production—Whatever You Need in Wire Rope Lines is in Nearby Stocks When You Need It

Bettering Union wire rope for oil field service is a project of many years standing. It is carried on by an organization of wire rope specialists. In the oil fields and in Union Wire Rope laboratories and factories strategically located in the Heart of America, the project never ends.

You get a plus value in the resulting top quality of Union wire rope. You get another plus value in Union Wire Rope service. So that you need never have to take anything less than top quality, Union Wire Rope operates the five warehouses indicated on the map above.

Each is managed and manned by specialists with the "know how" of proper wire rope application. Also, each carries a stock of top quality rope close at hand for Union Wire Rope distributors to draw upon to supply you with whatever you need, exactly when you need it.

You are invited to make full use of this unmatched oil country wire rope service.

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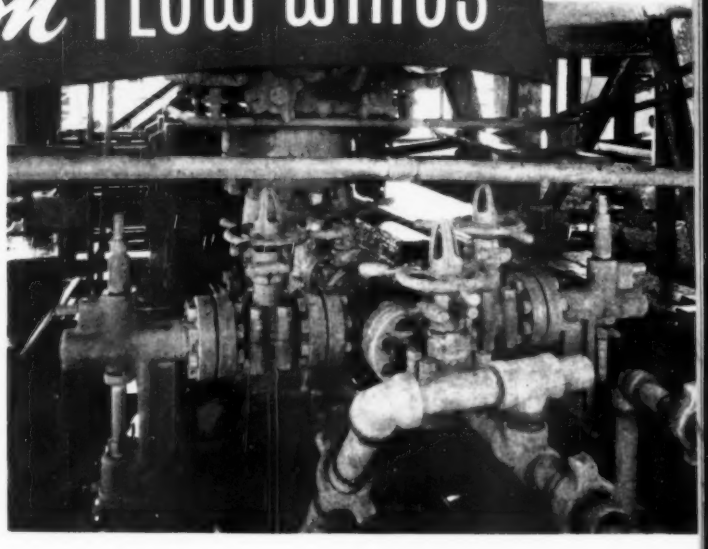
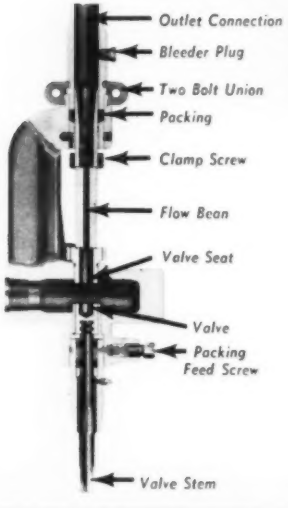
HERE'S FLOW CONTROL AT ITS VERY BEST!

Cameron FLOW WINGS



Cameron Type "D" Flow Wing on a Christmas Tree.

Two Cameron Type "D" Flow Wings in a drilling choke manifold.



Wherever there's a need for dependable flow control—on a high pressure producing well or in a choke manifold for bleeding-off pressures encountered during drilling—Cameron Type "D" Flow Wings are unsurpassed.

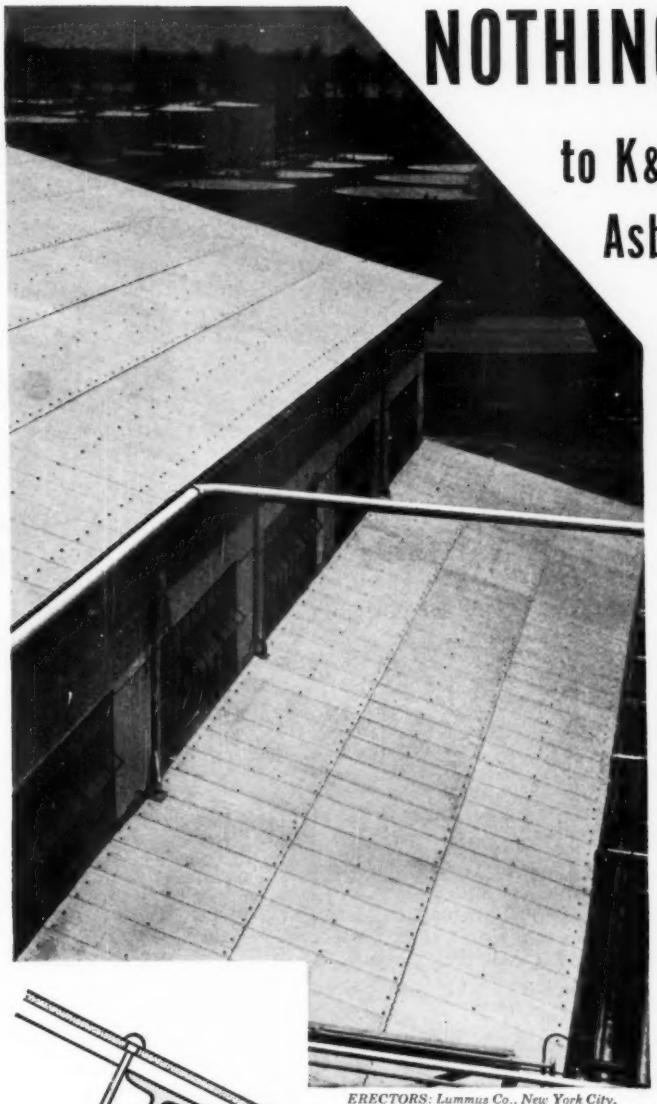
The unitized, compact, Cameron Flow Wing does the work of several conventional fittings combined. Its easy-operable built-in valve provides a pressure-tight shut-off for choke changing. The choke, or bean, is out in the open—easy to get to—and requires only two turns of a clamp screw for removal.

See your Composite Catalog for complete details, or literature will be sent on request.

CAMERON IRON WORKS, INC.
P. O. BOX 1212 HOUSTON, TEXAS
Export: 74 Trinity Place, New York

NOTHING HAPPENS

to K&M *"Century"* Asbestos Corrugated



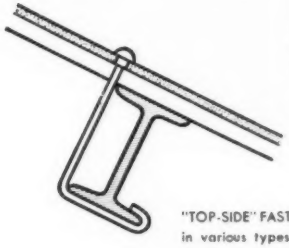
ERECTORS: Lummus Co., New York City.

Here you see it used for both the roofing and siding on this Shell Oil Company building at Deer Park, Texas. Don't ever expect to see it hurt by the weather or other adverse atmospheric conditions. Count on it to go rustless and rotless. It won't suffer from rodents and termites, and is exceptionally resistant to fire.

Easily cut and fitted on the job, K&M "Century" Asbestos Corrugated produces tight, good-looking surfaces at minimum labor cost. For extra savings use "TOP-SIDE"* fasteners, as on this Shell building. They entirely eliminate scaffolding and are only available with K&M "Century" Asbestos Corrugated.

Your finished job will benefit by the inherent structural strength of this material which actually gains strength with age. As for upkeep, you needn't figure on even one bit of paint!

*® H. & B. Enterprise Corp.



"TOP-SIDE" FASTENERS are made in various types, to fit all steel members on both roofing and siding. Illustration of typical "J" type for roofing.

Nature made Asbestos...
Keasbey & Mattison has made it serve mankind since 1873

K&M best in asbestos ®

KEASBEY & MATTISON
COMPANY • AMBLER • PENNSYLVANIA

NEW AMERICAN IRON TYPE GM CONTROL HEAD PACKER WITH DOVETAIL SLIPS

- Specially engineered dovetail slips and guides!
- Patented lateral expanding cup assembly (sealing element)!
- All the seal is accomplished in one sealing element!
- Patented simple-setting arrangement!
- Full tubing size opening through length of packer!
- Smooth running because of ample fluid by-pass area!
- Choice of large, carefully heat-treated friction springs or friction block assembly!

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This Type GM American Iron Control Head Packer has ALL the field-tested features of our popular Type G Control Head Packer PLUS such additional features as Dovetail Slips! It is available with friction block assembly instead of friction springs, if desired. In every way, this packer is engineered for extra heavy-duty performance requirements encountered in areas where extremely difficult conditions exist. Just like our Type G Packer, this Type GM Packer seals without crushing the cup because the super cup assembly is expanded laterally—not compressed! And the complete seal is accomplished with this one sealing element which results in a large, perfectly sealed area that withstands highest pressures encountered.

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OKLAHOMA CITY U.S.A.

REMEMBER, THERE IS AN AMERICAN IRON SERVICE MAN IN EVERY ACTIVE FIELD

They Say—

The First Oil Well

Sir:

Lately much has been said of the first oil well drilled in the world, especially in the North American Continent. Everyone seems to know of the first well drilled in Pennsylvania in 1859 by Edwin L. Drake. . . .

In the International Petroleum Co. here we have old photographs of Talara—the most important petroleum area of the Pacific Coast in this continent — which show a primitive well which is said to have been dug without modern drilling practices, as far back as 1850 . . . I should appreciate it very much if you would tell me which was the first well drilled in the world.

Antonio Olivas,
International Petroleum Co., Ltd.,
Lima, Peru.

Editor's note—Canada, Russia, Mexico as well as Peru have disputed U. S. claims to the first oil well. The other "firsts" have not been sufficiently authenticated to be accepted by industrial historians. The Drake well appears safe in its position of being the first which was DRILLED expressly for the production of oil.

Revamped Refineries

"More and more people continue to move to the West. So more and more gasoline is needed to meet their requirements. Now you can't get gasoline out of a barrel of crude without producing some fuel oil. As a result more fuel oil is being produced at a period when less is needed. And time will make the maladjustment worse instead of better.

"So the industry is faced with a major change in refining techniques. Several processes that will enable us to convert fuel oil stocks into gasoline have already been blueprinted. But building the equipment is going to cost a whale of a lot of money. Estimates for such installations at Union Oil alone range from 40 to 70 million dollars. But they will be built because they have to be built if we're to stay in business." *Ad in The Minute Man, Union Oil Co. of California.*

Remember the Gasoline Tax

"Congress should not overlook the federal gasoline tax and automotive levies when it seeks to revise the tax structure by eliminating 'burdensome excise taxes.'

"The federal gasoline tax was first imposed in 1932 as a temporary, emergency measure to help balance the budget. In recent years concerted efforts have been made by certain

For night lighting, and power for maintenance tools use

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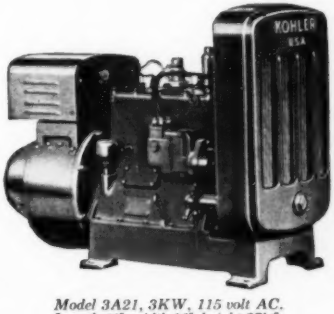
Electric Plants

Kohler Electric Plants help build efficiency wherever used for lighting and power tools on drilling rigs or pipe lines. Backed by 30 years of engineering research, they have established many remarkable records of long satisfactory service under the severe conditions found in the oil fields. They are easy to mount, require minimum attention and are economical to operate. The wide range of sizes will fit every requirement.

Where stand-by protection is needed, Kohler Electric Plants are also widely used. When storms or accidents interrupt central station electricity, stand-by Kohler units take over the load immediately—safeguarding the operation of important equipment and lighting at refineries, hospitals, stores, schools, farms, homes and other places.



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groups and interests to relate the federal gasoline tax to a high level of federal highway aid grants. The objective of this type of activity, of course, is the permanent retention of the motor-fuel levy in the federal tax structure." *The Hoosier Independent, Indiana Independent Petroleum Association, Inc.*

Dollar-Saving Oil

"Canada is benefiting in many ways from the rapid development of the western oil fields, but the most immediate and at the moment perhaps the most important result of the new discoveries is the saving of American dollars which formerly had to be spent on imported oil.

"Today, the supply of prairie oil exceeds its available outlets, with the result that production is less than it might be. Yet even at the present restricted level, western oil is reducing Canada's need for American dollars by about $90 millions a year.

"This substantial betterment in U. S. exchange serves to underscore the importance of finding new outlets for western oil as quickly as possible." *Imperial Oil Review, Imperial Oil, Ltd.*

Active for a Kid

"For a youngster less than 3 years old, the infant oil boom in Alberta, Canada, is reaching really gigantic proportions. Not for a good many years have North American oil men been so interested in a new prospect." *Barnsdall Life, Barnsdall Oil Co.*

L.P.G. to the Rescue

"When the natural-gas line serving the city was severed yesterday afternoon we were left without the services of our linotype machine. After learning that the gas service would not be restored until this morning, we looked about for some solution to our melting pot heating problem. Fortunately, Harold P. Grubbs, Ashland oil dealer, stocks bottled gas and with the help of Morris Grubbs and Willie Mungle, we were able to resume linotype operations early last night. Without the help, knowledge, and equipment of these men, who rigged us up with gas service in short order, you would not be reading the paper as usual this morning." *The Citizen-Times, Scottsville, Ky.*

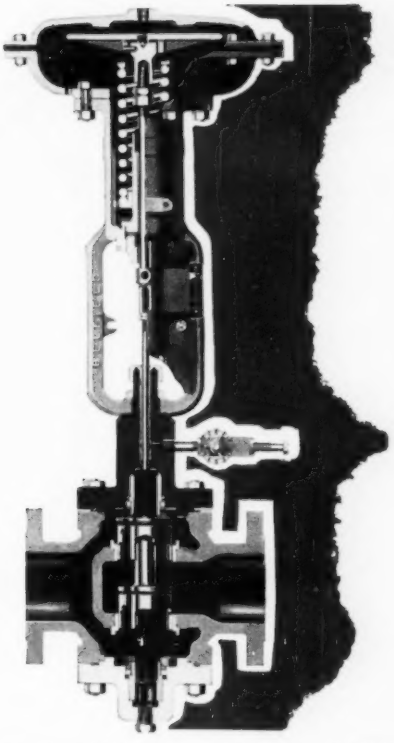
1,000-Mile Change

"The oil change controversy is a little like the one about getting a prophylactic treatment from a dentist; many people go regularly and have good results and once in a while you meet a person who never goes and can still boast of good teeth.

"But an automobile engine and crankcase are different. One type of

YOU GET ALL 3 with the BELFIELD "700"

Diaphragm Control Valve



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NEWS

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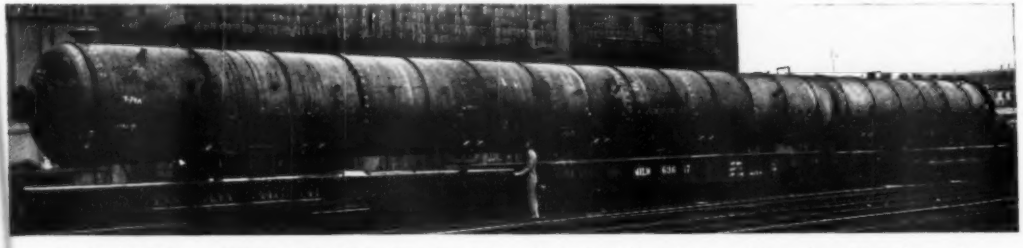
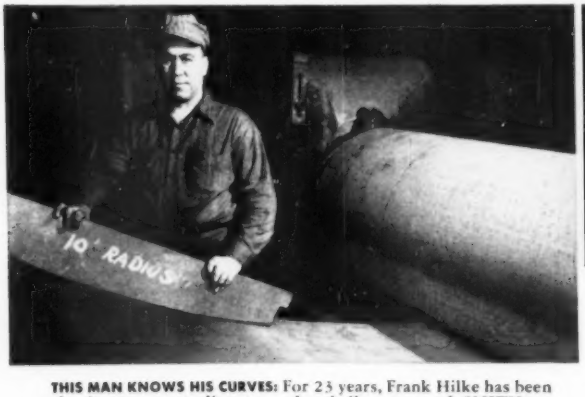
Tulsa 3 · Houston 2 · Seattle 1 · Los Angeles 14
International Division: Milwaukee 1

NEW BULLETINS: Write the nearest A. O. Smith office listed above for these new Bulletins: V-44—Field Assembly of Pressure Vessels; V-46—SMITHway Vessels, Alloy, Alloy-Lined, Clad, and Glass-Lined.

BY WATER AND RAIL, A. O. Smith ships pressure vessels for the petroleum, paper, and process industries. The SMITH-lined Fractionating Tower above, one of the largest shop-fabricated vessels ever built (16 ft. diameter by 116 ft. long, weighing over 320,000 lbs.), is going by barge to an oil refinery in the Chicago area.



SOME 60 SMITHway PRESSURE VESSELS for both low and high temperature service have been ordered during the last four years by one company to equip two new plants. This SMITHway Tower, three railroad cars long, 116 ft. by 7 ft., weighing 137,000 lbs., is one of the types of vessels furnished.



THIS MAN KNOWS HIS CURVES: For 23 years, Frank Hilke has been shaping, to exact diameters, the shell courses of SMITHway Pressure Vessels. He uses a variety of rolls which can produce any diameter needed for pressure vessels.

RECORDING CONTACT RESISTANCE AS LOW AS 1/1,000,000 OHM. Intensive research into the surface resistance of various alloys of different finishes and thicknesses has played an important part in the development of the A. O. Smith process of resistance welding alloy linings to carbon steel backing. This SMITH-built instrument was designed to measure the various resistance properties of the alloy linings and is a valuable tool in the control of the quality of A. O. Smith resistance welding.

chemical reaction takes place if you do not drive your car at all; another if you drive slowly. If you drive fast in heat you get one set of reactions and if you drive slow in cold, another. If you drive in dust you are sucking dirt into your engine.

"In short, a crankcase is a dirty thing anyway you look at it and the more dirt deposited the quicker your car wears out.

"Of course filters have done wonders in prolonging engine life; that's why so many people buy second-hand cars on the looks of the body and the upholstery and do not even check the engine—unless it makes a lot of noise.

"The impetus for less frequent oil change comes from the car makers, whose natural self-interest is to make cars so they will use less of everything. Play safe—it costs many times the expense of the 1,000-mile oil change to tear a motor down and rebore cylinders. To say nothing of being without your car and saving gasoline by having a tight motor." *Dr. Gustav Egloff, in the Chicago Daily News.*

About Gasoline

"Here are a few things your customers ought to know about gasoline—a few facts you can give them simply and quickly—and a few thoughts for you and your customers to turn over in your minds:

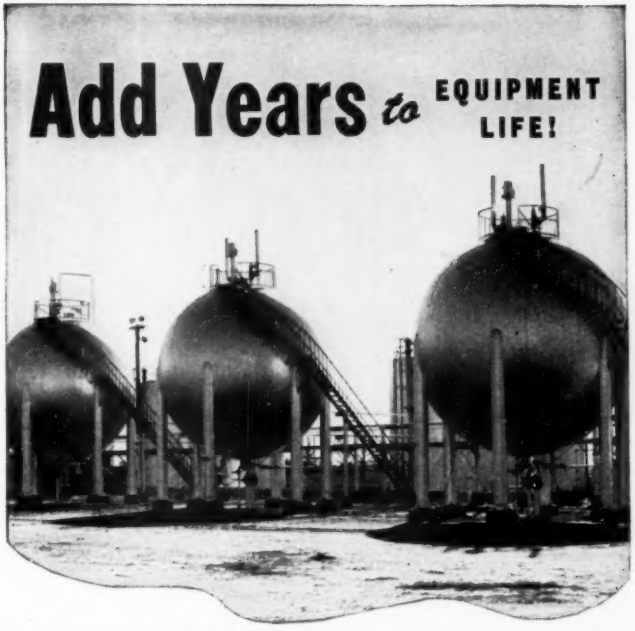
"1. Gasoline is *cheaper today* than it was during the period 1926-1945 in relation to wholesale commodity prices generally and average hourly earnings.

"2. The refiner has to pay *more than twice as much* as he paid 10 years ago for crude oil, refining equipment, and operating costs. Yet the retail price of gasoline is up only 43 per cent!

"3. Today's motorist gets more *quality* for his money than ever before. Regular-grade gasolines among the better-known brands today give about the same performance that most premium gasolines gave 10 years ago!" *Humble Sales Lubricator, Humble Oil & Refining Co.*

A Lot of Oil in 90 Years

"Crude-oil production of the United States since the Drake well in 1859, through 1948, has aggregated 37,098,791,000 bbl., according to preliminary A.P.I. figures. Six leading oil fields are credited with having produced 15.4 per cent of this total, or 5,747,683,000 bbl. These six oil fields and their cumulative production of crude oil through 1948 are East Texas, 2,577,365,000 bbl.; Long Beach (California), 734,684,000 bbl.; Midway-Sunset (California), 736,027,000 bbl.; Oklahoma City, 662,690,000 bbl., and Santa Fe Springs (California), 522,886,000 bbl." *The Diamond, Mid-Continent Petroleum Corp.*



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There's a LOT more to Perforating

than making holes in the casing!

There are the important questions of what kind of holes, what size, where, how deep; the vital considerations of well condition and of safety. Lane-Wells answers all these questions with methods and equipment developed and proved in over 120,000 successful perforating jobs. To detail briefly a few of the most important features of bullet perforating.

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BULLETS: Sixteen bullet sizes, in six different types for deep penetration, for burr-free holes, for casing removal or cement fracturing, for single-string penetration, for tubing penetration, and for other purposes. *One* of them is just right for your jobs.

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SAFETY: A five-point firing system makes accidental discharge impossible, providing maximum safety to property and personnel, and insures against damage to your well.

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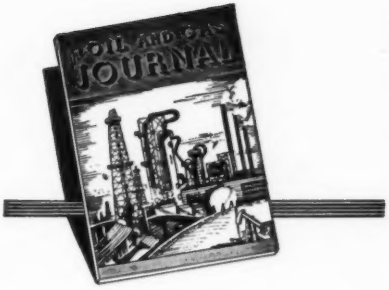

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JOURNALLY Speaking

Well, Well

WHAT'S the deepest well? Well, what's a well? Superior drilled its Pacific Creek well more than 20,000 ft. but got a dry hole. When it was drilling it was called a well. But now that it's been abandoned as dry it's improper—in oil men's language—to say that Superior "got a well." But if it isn't a well any more, what is it? And when did it cease to be a well?

Up to now both Shell and Pure claimed to have the deepest producing well. Pure's West Poison Spider well produced from its bottom at 14,307 ft. Shell's Week's Island well produced from perforations at 14,255 ft., but its bottom at 14,350 ft. was still in the producing sand. Which is the "deepest?"

Now Standard of Cal. claims production at 15,250-15,530 ft. in Kern County. That would seem to make it the deepest producing well, all right, but is it a deeper well than Superior's? We give up; it's too deep for us.

Drake Again

A MONTH or so ago this department tried to help along the celebration of the ninetieth anniversary of the Drake well with a few comments on the origin of the oil industry, and that friendly gesture seems to have embroiled us in a historical controversy.

For instance, Karl A. Mygdal of Pure Oil Co. writes that as early as 1800 the Burmese produced oil from shafts dug by hand several hundred feet deep. Since water was produced in the region by the same technique and the holes were called water "wells" rather than water "pits," Friend Mygdal suggests that the Burmese excavations should be called oil wells and not oil pits.

Maybe so. We refuse to get into an argument over anybody's definition of "well." Nor de we claim to be an authority on the early history of oil. All we said was that Drake's was the first well **drilled for oil.** All three words must be stressed. Wells had been drilled before Drake. Oil had been produced before Drake. Wells drilled for other purposes had produced oil before Drake.

So far as we have ever heard, Drake was the first man to use the drilling method of getting below the surface for the express purpose of producing oil. Anyway, our chief point was that it was Drake's well which started the oil industry, even though there is plenty of evidence that oil was produced and used for various purposes by ancient peoples in faraway places centuries ago.

It's sort of like the discovery of America. Undoubtedly Europeans saw these shores before 1492, but the history of the White Man in the Western Hemisphere begins with Columbus.

How did we ever get to be Drake's defender in the first place? We never met the guy.

Plugs

DID you take our advice last week and stick on your wall that emerald-hued map of natural-gas pipe lines? And does some friend envy your taste in interior decoration and covet a copy? Or did somebody in the office beat you to it and latch on to the map before it reached you?

In any event, extra copies may be obtained from our Reader Service Department at a buck and a half a throw.

And while we're giving a plug to our R.S.D. we might mention that it has taken the "Drilling Handbook" which featured our September 22 special effort for drilling contractors and reprinted it as a 32-page booklet with what the art department says is a handsome cover. As we warned at the time, it won't be of much help if you never drilled a well before, but it ought to be worth 50 cents of any driller's money to get the reprint in booklet form.

—Henry D. Ralph

On being Penny wise

YOU use cement to tie the casing to the formations and you want to be certain it will hold—hold all fluids in proper place—hold them for the life of the well. The cost of the cement used is small, in proportion to the importance of the job it has to do. So it's penny wise and pound "thrifty" to select cement on its performance record—because past performance, and performance alone, tells you that you can be sure of its action and behavior under any given condition. LONE STAR CEMENT, 'INCOR'* CEMENT, and 'STARCOR'* CEMENT all have outstanding performance records—select the one that fits your job.

*Reg. U. S. Pat. Off.

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Here's why a "whirler" shoe "centered" in the hole is your best bet for cementing success

Out of the many different varieties of efficient shoes and collars for landing and cementing casing in a well, there is one outstanding combination for successful initial cementing—the BAKER CEMENT WASH-DOWN "WHIRLER" FLOAT SHOE (Product No. 120) used with BAKER Model "G" CASING CENTRALIZERS (Product No. 910-G).

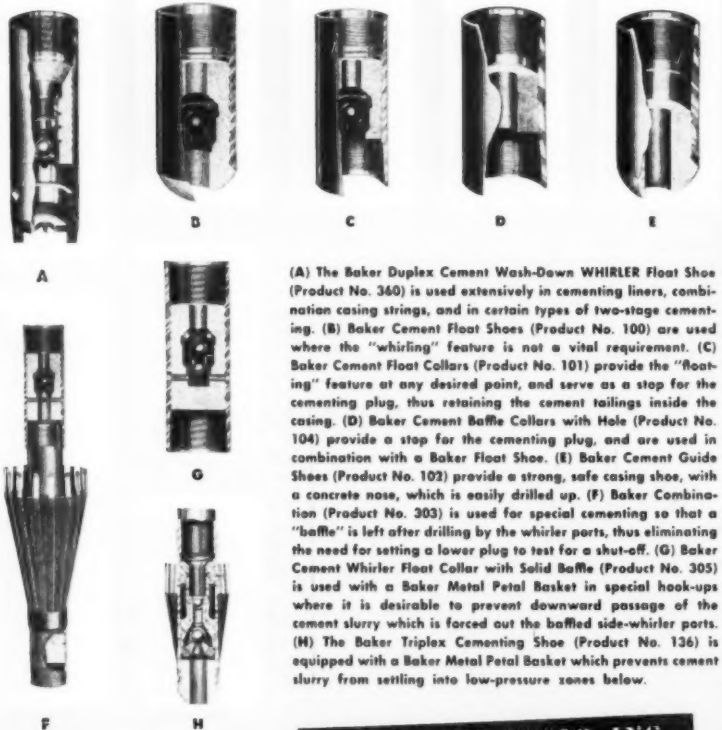
This superior shoe has ample strength to float in the longest, heaviest string of casing, with the exclusive Baker "Whirling" action to wash away bridges and condition the hole. Then, with the shoe and the first few joints of casing "centered" in the hole by Baker Casing Centralizers, the cement slurry is WHIRLED upward, and a uniform body of cement is placed *all around* the casing. Danger of channeling is minimized, and "first time" results are almost invariably secured.

Remember always that the Baker Cement Wash-Down WHIRLER Float Shoe is not merely a side-opening shoe, but it embodies the exclusive "Whirler" principle which has no equal for proper cementation.

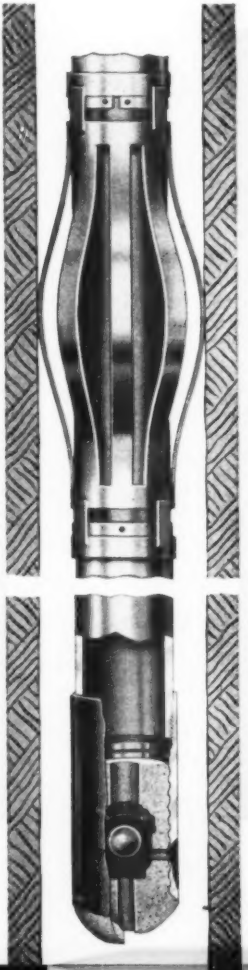
"HEADQUARTERS" FOR CEMENTING EQUIPMENT

Baker also offers the widest variety of products and equipment to perform special and remedial cementing, a few popular items being pictured here. Whether you have a routine cementing job, or must have a custom made hook-up for a difficult "life saving" operation on your well, there is a Baker product to meet your exact needs.

It will pay you well to check with the Baker representative in your area before you undertake *any* cementing work. Helpful suggestions, and courteous, intelligent cooperation are yours for the asking.



(A) The Baker Duplex Cement Wash-Down WHIRLER Float Shoe (Product No. 360) is used extensively in cementing liners, combination casing strings, and in certain types of two-stage cementing. (B) Baker Cement Float Shoes (Product No. 100) are used where the "whirling" feature is not a vital requirement. (C) Baker Cement Float Collars (Product No. 101) provide the "floating" feature at any desired point, and serve as a stop for the cementing plug, thus retaining the cement tailings inside the casing. (D) Baker Cement Baffle Collars with Hole (Product No. 104) provide a stop for the cementing plug, and are used in combination with a Baker Float Shoe. (E) Baker Cement Guide Shoes (Product No. 102) provide a strong, safe casing shoe, with a concrete nose, which is easily drilled up. (F) Baker Combination (Product No. 303) is used for special cementing so that a "baffle" is left after drilling by the whirler ports, thus eliminating the need for setting a lower plug to test for a shut-off. (G) Baker Cement Whirler Float Collar with Solid Baffle (Product No. 305) is used with a Baker Metal Petal Basket in special hook-ups where it is desirable to prevent downward passage of the cement slurry which is forced out the baffled side-whirler ports. (H) The Baker Triplex Cementing Shoe (Product No. 136) is equipped with a Baker Metal Petal Basket which prevents cement slurry from settling into low-pressure zones below.



BAKER OIL TOOLS, INC.
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THE OIL AND GAS JOURNAL

Oil Progress Week

NEXT week several thousand oil men in several hundred communities will take part in a wide variety of functions collectively known as Oil Progress Week.

The nation has many official and unofficial "weeks," more than there are calendar weeks in a year, so many that the subject has become standard material for jokesmiths. The promoters of most of them are trying to sell some commodity, and usually they ask the White House to issue an official proclamation to help them along.

Oil Progress Week is not an attempt to sell more oil. It is not a publicity "stunt" for any company or group. The President was not asked to proclaim it, and no effort is being made to induce national "observance" by the public.

Its purpose is not to help the oil industry make progress, for it has done that in a remarkable fashion, without any help, for nine decades. Nor is it to make the blase American public grateful for the improvement in living attributable to petroleum.

The objective is to show why petroleum has been progressive, why it has grown to be this amazing industry, why it has brought so many material benefits to this country—and why no other country has anything like it.

The why, of course, is the competitive enterprise, the freedom to take a chance with hope of profit, that underlies all economic progress. As the leading example of this, the oil industry is properly its leading exponent, and Oil Progress Week provides a means for telling the story.

Its origin was rather spontaneous. Last year an Oil Progress Day, conceived to point up the current public-relations program, was such a success that many communities suggested that it be repeated and extended to a full week. So it was, but both planning and execution were left to the inclination and ingenuity of local groups of oil men. There is some nation-wide publicity and, when requested, some suggestions and assistance from the industry's professional public-relations staff, but Oil Progress Week in any community is what the oil men there want it to be.

This is the unique feature and the strong point of Oil Progress Week. Local oil men stage it for their neighbors. In doing so they think and talk about what makes and keeps the oil industry progressive. They learn that their neighbors do not understand much about the oil industry and what made it what it is. Perhaps they did not fully understand it themselves.

In planning picnics and parades, staging exhibits and open houses, preparing or delivering speeches, oil men everywhere are unconsciously becoming missionaries for free enterprise. This sort of thinking and talking and explaining becomes a habit which lasts the year around. This is the real value of Oil Progress Week.

Third-Quarter Figures Suggest

1949 Demand Will Set New Record

by John C. Casper

FIGURES on the oil industry's activity during the third quarter of 1949 are now available and permit an analysis of how the year is apt to compare with the record of 1948 and a test of predictions that demand for the entire year might exceed that of last year.

Total demand for crude and petroleum products in the third quarter was at about the same level as last year. Since demand in the first half of the year was down about 3 per cent from the first 6 months of 1948, the industry starts the last quarter with a cumulative deficit of 2 per cent for the first 9 months.

If total demand in the last quarter is 10 per cent greater than last year, demand for the year will show an increase of 1 per cent. It will take a gain of about 6 per cent for the last 3 months compared with the same period last year to keep 1949 even with 1948.

Pickup Arrived Late

Following a very slack period during the early summer, when sales of heating oils were below normal, most suppliers expected a sharp gain in fillup sales during the third quarter. July passed with a decrease of 3.8 per cent in total demand. Fillup deliveries on a normal basis did not start until the middle of August, too late and too small to bring August demand up to the level of the previous year. September was the first month to show an increase over the same month in 1948. Demand estimates for the month indicate an increase of about 5 per cent over September of last year. However, part of September's percentage gain is due to the fact that demand in the same month last year was below normal because of refinery strikes in California.

There are several major questions relating to the possible demand increases for the last quarter. Will high gasoline demands continue? Have fillup sales of home-heating fuels been completed? Will resellers carry normal stocks throughout the winter? How much will strikes in coal and steel industries affect demand for heavy fuel? Will exports decline?

Since there has been a steady increase in the number of motor vehicles in operation, gasoline demand will be greater than it was last year, but the percentage increase for the winter months will be below the year's average because of abnormally high demand last winter.

Since there was not enough gain in distillate demand in the third quarter to offset the decreases in the second, some fillup sales of distillate fuel may swell the fourth quarter demand. However, early winter deliveries of this type may be less than anticipated since the current high level of primary stocks tends to influence resellers and consumers in a decision to carry smaller inventories.

The first effect of coal and steel strikes will be an increase in the demand for residual, as utilities and heavy industries seek to establish a firm fuel supply. Consumption of residual by electric utilities in August was up 73.4 per cent over August of last year. On the other hand, a long period without steel production would result in a sharp decline for all heavy industry and a loss of some of the advantage now held by residual fuel.

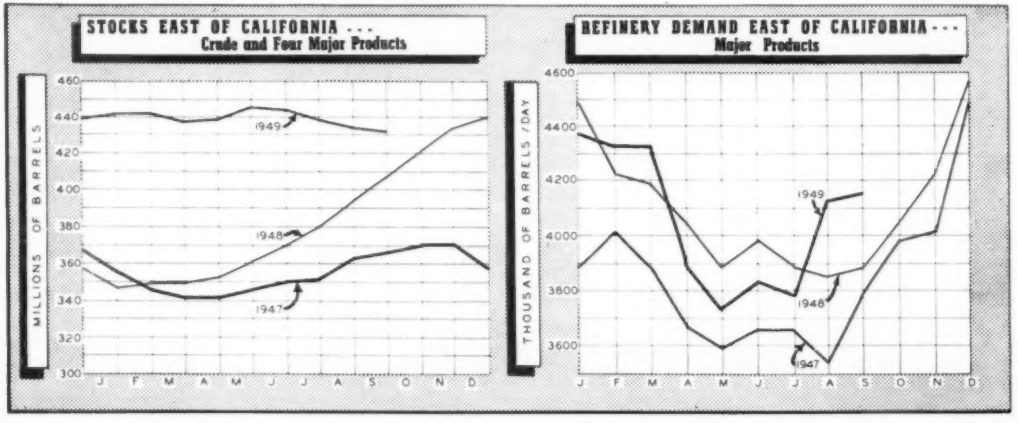
Demand in the fourth quarter is expected to be about 8 per cent higher than last year but cold weather in the areas of high distillate consumption could raise over-all demand enough to show a 1 per cent increase for the year.

Stock Picture Clouded

For several months the statistical picture of stocks and demand has been somewhat clouded by the fact that different conditions exist in two integrated areas. Stocks in the Pacific Coast area have been increasing while stocks in other areas were dropping.

The charts at the bottom of the page show stocks and refinery demand for all areas east of California. The line representing stocks in 1948 indicates an increase for every month after January with the sharpest rise from the end of July to the end of November. A normal stock curve increases during the second and third quarters, reaching a peak in either September or October.

If new supply could have been held more nearly in balance with demand in the last half of 1948, production cuts could have been less drastic in the first half of 1949. New supply in 1949 had to be cut back far enough below demand to allow for reduction of inventories accumulated before the end of last February. The



reduction has been made by cuts in domestic production. Imports are running ahead of last year. Reductions in crude production and refinery runs have resulted in decreases in stocks of crude and major products east of California for every month since May, normally a period of stock increases.

Refinery demands do not show actual demands for products but are based on production and stock changes to indicate demand trends. Refinery demand for the four major products in areas east of California had an earlier and sharper upturn than over-all demand. Increases were recorded for both August and September and gains in the last quarter are expected to be better than for the country as a whole.

Percentage reductions in California production have not been as great as in other important producing areas. The result has been a rapid gain in stocks in a period when other areas were reducing inventories. Production in California in the first 7 months was less than 1 per cent under the same period last year, while reductions in all other areas combined amounted to almost 8 per cent.

West Coast demand in the first 7 months was down 5.6 per cent from the same period in 1948, compared with a reduction of about 2.7 per cent for all other areas.

The most troublesome feature of the supply-and-demand balance for the West Coast has been the 63 per cent increase in residual-fuel stocks since the first of the year. The principal reason for the drop in heavy fuel demand has been the decline in sales to railroads. The Bureau of Mines reported West Coast deliveries to railroads in the first 6 months amounting to 60,000 bbl. daily, compared with 94,000 bbl. daily in the same period last year. Commercial bunkering was off 6,000 bbl. daily for the same periods.

Most industry men believe that at least a partial solution of the California problem can be found in the addition of new refinery equipment to raise the yields of light products. However, this is a long-range solution and will not relieve the current pressure from excess stocks. Industry estimates indicate that crude production must be reduced about 75,000 bbl. daily if further inventory increases are to be avoided.

State Department Rules Restrictions On Oil Imports to Be Unnecessary

WASHINGTON.—The State Department held this week that while petroleum imports are expected to increase during the remainder of this year and through the first half of 1950, any restrictions on imports "are unnecessary and would be both unwise and detrimental to the interest of the petroleum industry and of the United States."

The department's views were made known by Assistant Secretary Willard L. Thorp in a letter to Rep. Ed Gossett of Texas, at whose request a study of the import situation was undertaken some weeks ago.

Thorp repeated the previously asserted finding of the department that imports so far have not been a major factor in curtailment of domestic production, which he called "an adjustment to democratic condition," and pointed out a similar conclusion was reached last May by the tariff commission in rejecting the petition of the Independent Petroleum Association of America for a formal investigation of the situation under the escape clause in the Mexican reciprocal trade agreement.

The expectation of a future increase in imports, Thorp explained, is based on returns from 10 or 12 principal oil-importing companies which were asked to furnish estimates of their projected imports and exports through the first half of next year.

"The combined estimate for the 10 companies indicates a steady but moderate increase in imports of crude oil during the balance of 1949 and the first half of 1950," he reported to Gossett. And they show a sharper increase in imports of refined products during the winter months with a substantial decline thereafter. The increase in imports of refined products is, however, almost wholly accounted for by heavy fuel oil. Imports of heavy oil indicate that they cannot get enough of it at competitive prices to meet their market requirements. They also indicate that in view of the substantially low price for this product as compared with crude oil imported heavy fuel oil does not compete with markets for the domestic crude-oil output," he said.

On the other hand, Thorp said, demand also is expected to return to almost the highest level in history, the latest Bureau of Mines forecast estimating that an increase of approximately 700,000 bbl. daily will be required in domestic output for the fourth quarter of this year. This will permit a substantial increase in production in Texas, where the cuts in output were largely made.

The reports of the 10 companies, which account for between 86 and 92 per cent of our foreign trade in crude and products, indicate that imports of crude will rise from an average of 372,000 bbl. daily in July of this year to a high of 445,000 bbl. by June 1950, while exports will average 86,000 bbl. daily through the remainder of this year and run 80,000 to 82,000 bbl. during the first half of next year.

Imports of refined products, which averaged 204,000 bbl. daily in July, are foreseen as reaching a peak of 298,000 bbl. next February, thereafter dropping off to around 162,000 bbl. daily in the second quarter, while exports will gradually decline from 182,000 bbl. daily in the third quarter this year to 151,000 bbl. in the first quarter of 1950 and increase to 154,000 bbl. in the second quarter.

Total imports may exceed exports by as much as 486,000 bbl. daily by next February, thereafter tapering off to 365,000 bbl. in June, the companies reported.

Thompson Says Texas Ready for Emergency

HOUSTON.—Texas has fully recovered all its losses in oil-producing ability that were suffered during World War II, Railroad Commissioner Ernest O. Thompson said here last week.

Speaking before the Houston Traffic Club, Thompson told his listeners that "Texas is ready to produce 80 per cent of any needed emergency oil, just as we furnished from Texas 80 per cent of the oil for World War II." He attributed this producing ability to conservation of reservoir energy.

The commissioner labeled 1949 a "year of real progress in oil in Texas" and backed his statement up with figures on oil activity. As of September 10, 6,014 wells had been completed in the state, compared with 5,085 in the same 1948 period. Regular and special drilling applications granted by the commission thus far in 1949 stand at 10,091, compared with 9,766 in 1948. Operators have discovered 328 new oil fields and 69 new gas fields since the first of the year. There are a total of 1,630 separate oil fields in Texas with 115,227 oil wells in them.

Texas is producing all of the crude oil that "the market demands," Thompson stated. Figures on production from a report of the Texas state controller, he said, show that during the fiscal year 1949 Texas produced 811,882,339 bbl. of oil, as compared with 868,575,835 bbl. during the previous fiscal year. The value of Texas' oil production in fiscal 1949 was $2,117,289,471, as compared with a value of $2,079,886,513 in fiscal 1948.

Ray Sager, president of the club, presided at the luncheon, and Gregory Walsh, Cities Service Oil Co., was program chairman.

A.P.I. to Study Management, Technical Problems in Meeting

NEW YORK. — The announced theme is "90 Years of Progress," but the program of the annual meeting of the American Petroleum Institute in Chicago November 7-10 reveals that much more attention will be given to the future of the oil industry than to its past.

Problems of today and tomorrow in both the technical and the management sides of the industry dominate the topics scheduled for general sessions, group conferences, and committee meetings.

This is particularly true of the group session of the refining division, which promises to be of such wide interest that it has displaced one of the usual sessions and will be held Thursday morning in the largest hall available. Here William M. Holaday of Socony-Vacuum Oil Co., Inc., will talk on the present and future utilization of fuels, while Walter G. Whitman of Massachusetts Institute of Technology will follow with a discussion of liquid-fuel supplies and national security.

Holaday will discuss such questions as these: For maximum efficiency and conservation of our resources, should we use coal, liquid fuels or gas? Which is best for power production—steam or internal combustion engines? What should be the fuel for steam power—coal or oil or gas? What should be the fuel for internal combustion engines — diesel fuel or gasoline?

General Sessions Planned

Whitman will give his opinions on these questions: Responsibility for national security—Who holds this responsibility? Wartime fuel requirements—What about the next war? Continental American crude — What will be their characteristics in the future, and how will these characteristics affect military fuel production?

Other Whitman questions revolve around these points: Timing of discovery and development — What is best for our country? Stock-piling versus Imports—What should we do? Synthetic Fuels—Should we conserve our crude reserves and go the synthetic route, and if we do go the synthetic route, what should we use in the production of synthetic fuels? Gas? Bunker Oil C? Shale? Coal?

The two general sessions Wednesday will feature three speakers from the industry and three outside. President William R. Boyd, Jr., will give what probably will be his farewell address, since he has announced that he is retiring after this meeting. He will be followed by Dr. Robert E. Wilson, chairman of the board of Standard Oil Co. (Ind.), and J. Howard Pew, retired president of Sun Oil Co.

Sen. Robert S. Kerr of Oklahoma will represent the federal Government, and has chosen the topic "America Unlimited." "What of Tomorrow?" is the topic of Adm. Louis E. Denfield, chief of naval operations, who is expected to discuss petroleum's future role in naval operations. Politico-economic problems will be discussed by Edmund P. Learned, of the faculty of Harvard School of Business Administration, speaking on "Integration in American Industry."

There will be group sessions on marketing, public relations, lubrication, and fire protection, and approximately 90 committee meetings are scheduled. The more important papers scheduled for other group sessions are as follows:

Pipe-line symposium: "History and Development of Products Pipe Lines," J. W. deGroot, Tuscarora Oil Co., Ltd.; "Field Performance of Modern Pipe Coatings," Gordon N. Scott, Consulting Engineer, Los Angeles, Calif.; "The Value of Vocational Training in the Pipe-Line Industry," J. R. Mills, Jr., Standard Oil Co. (Ind.); "Control of Vapor-Zone Corrosion in Storage Tanks by the Use of Ammonia," F. T. Gardner and A. T. Clothier, Carter Oil Co., and Francis Coryell, Interstate Oil Pipe Line Co.; "The Producer and the Pipeliner Discuss Lease-Tank Practices," M. H. Shanahan, Continental Oil Co., and R. C. Nicholson, Shell Pipe Line Corp.; "Pressure Surge Tests on Oil Pipe Lines," J. E. Green, Shell Pipe Line Corp.

Production session: "Rotary Percussion Drilling," Paul L. Guarin and H. E. Arnold, Shell Oil Co.; "A Study Group Investigation of Equipment and Techniques for 20,000-Ft. Drilling," John M. Payne, Shell Oil Co.; "Design of Oil-Well Pumping Equipment," S. B. Sargent, Huntington Park, Tems," B. L. Moore, Humble Oil & Refining Co.; "Executive Training in the Oil Industry," G. B. Corless, Standard Oil Co. (N. J.); "Some International Aspects of Canadian Oil and Gas Development," N. E. Tanner, Minister of Mines and Minerals, Edmonton, Alberta, Canada; "The History of Drilling Technology and Its Prospects," J. V. Pennington, Drilling Research, Inc.

Transportation session: "Radio and the Petroleum Industry," Commissioner E. M. Webster, Federal Communications Commission; "Basic Issues in National Transport Reorganization," Charles L. Dearing, Brookings Institution; "Transportation in Offshore-Drilling Operations," Thomas Pennington and James C. Posgate, Humble Oil & Refining Co.

Continental Dedicates New Refinery

BILLINGS, Mont.—Continental Oil Co. held dedication ceremonies and open house here October 8 for its new $9,500,000 refinery. This latest Conoco plant, with a daily crude-oil capacity of 7,500 bbl., will be the number 8 refinery that the company operates, besides the new lubricating-oil unit erected at Lake Charles, La., in partnership with Cities Service Co.

Seven thousand interested Montanans and other visitors inspected the various plant units during the ceremonies. And afterwards, the inside of a big 55,000-bbl. oil tank served as a unique dining room for the serving of hot lunches and coffee.

The refinery is located on a 118-acre tract of land adjoining the southeastern part of Billings.

The refinery contains a crude fractionation unit, propane deasphalting, catalytic cracking, catalytic desulfurization, catalytic polymerization, and liquefied - petroleum - gas equipment. Other facilities include a water-cooling tower, tank-car loading rack, truck loading rack, shops and warehouses, office building, oil trap, railway sidings, laboratory, tetraethyl lead plant, and tank farm for 700,000 bbl. of crude and refined products.

A mixed crude blend will be used as charging stock, essentially high sulfur (2.2 weight per cent) and of 28° A.P.I. gravity, the blend consisting of 60 per cent Elk Basin crude and 40 per cent light Frannie crude. Production will approximate 58 per cent of 10 lb. Reid vapor pressure gasoline, with clear unleaded octanes of 73.5 motor method and 80 by the research method. Design yields of other products are: propane and butane 3.5 per cent, middle distillates 15 per cent, fuel oil and asphalt 22 per cent.

The truck loading rack has a capacity for loading four transport trucks simultaneously, and there is a 12 double-spot tank loading rack. A total tankage of 438,000 bbl. is provided for finished and intermediate storage in 30 tanks.

Features of the dedication activities included addresses by Gov. John W. Bonner of Montana and President L. F. McCollum of Continental. McCollum said Conoco's first marketing operations in Montana were started in 1877, and that the firm has been a producer of crude oil in Montana and Wyoming for more than 30 years. He also said that during the past 18 months Continental has acquired oil leases on approximately 450,000 additional acres in Montana.

Superintendent at Billings is John A. Ramsey, formerly in charge of Conoco's Wichita Falls, Tex., refinery. Assistant superintendent is Kenneth S. Andrea, who was transferred from the company's Lake Charles refinery. J. E. Fenex is western region manufacturing manager for Conoco, located at Denver.

In next week's Journal will appear a feature article covering the design, engineering, process, and operational details of Continental's new Billings, Mont., refinery.

this week

REFINING—Completion of Cit-Con Oil Corp.'s new 6,000-bbl. lubricating-oil refinery at Lake Charles, La., announced. . . . Was designed exclusively for manufacture of lubricating-oil base stock and wax products. . . . ¶Shell Oil Co. acquires jet-equipped airplane for testing of fuels. . . . ¶Frontier Refining Co. announces plans to build new two-coil integral coking unit with capacity of 2,400 bbl. daily at its Cheyenne, Wyo., refinery. . . .

PIPE LINES—Great Lakes Pipe Line Co. plans further enlargement of its system by installation of a 165-mile, 12-in. line from Irvington, Neb., to Sioux Falls, S. D. . . . Terminals, pump stations also to be enlarged. . . . Over-all cost is estimated at $7,900,000. . . . ¶Standard Oil Co. (Ohio) will build 38-mile, 8-in. products line from Toledo to Fostoria, Ohio. . . . ¶Laying of pipe is completed for Argentine natural-gas line from Comodoro Rivadavia to Buenos Aires. . . . ¶Tennessee Gas Transmission Co. asks permission to construct Carthage field, Texas, outlet. . . . ¶Completion of Chile's first crude-oil pipe line expected in November. . . .

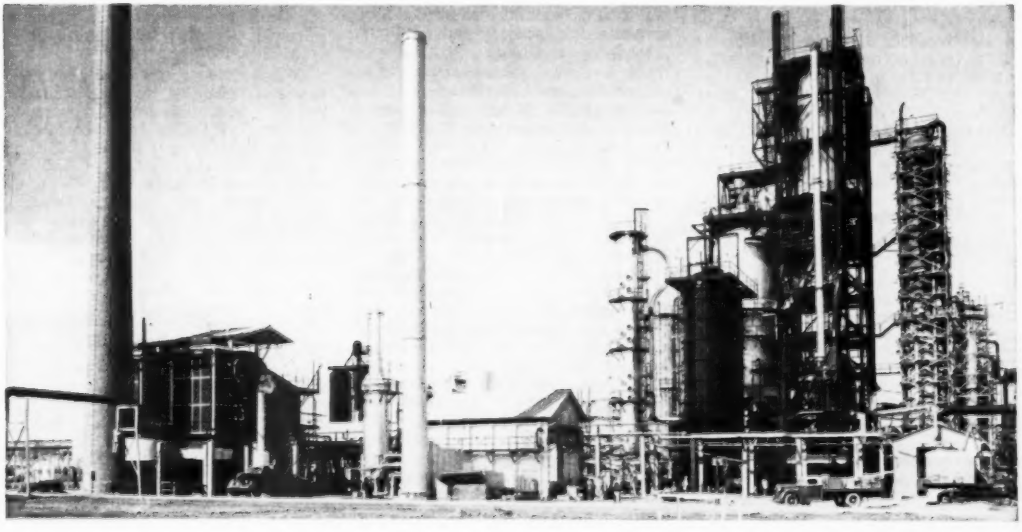
TRENDS—Residual fuel stocks east of California were reduced 1,600,000 bbl. during the third quarter, a period when inventories normally increase. . . . Current stocks of heavy fuel are about 9,800,000 bbl. less than last year. . . . Residual stocks in California increased 4,900,000 bbl. in the third quarter and are now 19,600,000 bbl. greater than in 1948. . . . ¶Plans for additional California-East Coast shipments of residual bring the estimated total for the coming winter up to 5,000,000 bbl., a little less than an average month's imports. . . . ¶Heavy fuel markets are firm in central, southern, and eastern areas. . . .

INTERNATIONAL—Socony-Vacuum wildcat in Oficina area of Eastern Venezuela tests 1,000 to 1,200 bbl. daily from two formations in dual completion. . . . ¶Mexico says petroleum imports during first half of 1949 cost 13 per cent more than in 1948 although only 4 per cent greater in volume. . . . ¶Serious financial problems reported by Ultramar Oil Co., Ltd., as result of limited production and heavy capital outlays. . . . ¶British companies begin negotiations with government officials with aim toward increasing prices of petroleum products. . . . Government approval of some increase expected. . . .

INDUSTRY—Production of synthetic fuels will not be required before 1961, A. L. Solliday, Stanolind vice president, tells petroleum division of A.I.M.E. . . . ¶Bright future for natural gas on West Coast is described before C.N.G.A. by J. B. Taylor, association president. . . . ¶Continental asks permission to unitize Crockett County field in first application under Texas' new unit-operation law. . . .

IMPORTS—State Department holds that restrictions on oil imports are "unnecessary" and would be "unwise," although increase in imports is expected during remainder of year. . . . Figures of Department of Commerce show August imports were below those of July, while exports increased in comparison with previous month. . . .

Partial view of Continental Oil Co.'s new $9,500,000 refinery in Billings, Mont., which was formally opened October 8. (See story on opposite page.) Left to right in this photograph are the boiler plant and stack, the crude furnace unit and tower, and the main catalytic cracking structure



Synthetic-Fuels Industry Not Needed Before 1961, Solliday Tells A.I.M.E.

by D. H. Stormont

SAN ANTONIO.—Discussions relative to fluid flow, phase relationships, core analyses, well logging, and natural-gas technology comprised the bulk of a comprehensive technical program presented here at the fall meeting of the petroleum branch of the American Institute of Mining and Metallurgical Engineers October 5-7. Some 850 research engineers and petroleum production experts, who set a new attandance record, were present to hear the 36 technical papers delivered during the 3-day meeting.

J. E. SHERBORNE

On the nontechnical side, addresses were given on the ownership of the Gulf Coast tidelands, whether synthetic fuels are needed now or later, management's obligations to its employes and the public, and the role of the engineer in today's industry.

John Sherborne, chief production engineer for Union Oil Co. of California, Los Angeles, was elected chairman of the petroleum branch for the coming year to succeed Lloyd E. Elkins, of Stanolind Oil & Gas Co., Tulsa. Elected vice chairmen were Paul Andrews, Signal Oil & Gas Co., Los Angeles, and R. W. French, Sohio Petroleum Co., Cleveland. Named to the executive committee were R. C. Earlougher, of the Tulsa engineering firm bearing his name, and John McMillan of Fullerton Oil Co., Los Angeles. They succeed I. W. Alcorn, Pure Oil Co., Houston, and Stuart Buckley, Humble Oil & Refining Co., Houston. Charles B. Carpenter of the U. S. Bureau of Mines, Dallas, continues as treasurer.

Solliday Discusses Synthetics

In his address on synthetic fuels, A. L. Solliday, executive vice president of Stanolind Oil & Gas Co., Tulsa, predicted that the United States will have all the petroleum it needs for at least a decade and that synthetic liquid fuels from coal and oil shale will not be needed before 1961.

In forecasting that our petroleum resources would meet all national needs until at least 1961, Solliday said his company, following extensive studies and research during recent years, estimated the country's net demand for oil would rise to 8,400,000 bbl. of petroleum per day by 1965, and by 1975 would reach 9,100,000 bbl. daily. By comparison the country will use 5,900,000 bbl. daily during 1949, he said.

Solliday told the engineers that domestic onshore and offshore petroleum reserves—which can be produced in the future—equal 113 billion barrels. Although domestic production can supply all our present needs, the next decade will begin to see a growing gap between supply and demand, he said.

Imports to Meet Deficit

He estimated that nearly all of this gap could be filled by imports from the Western Hemisphere—approximately 830,000 bbl. in 1960 and 2,900,000 bbl. in 1975. In the interests of national and hemispheric security, he believed the government possibly would limit imports from the Eastern Hemisphere to a top of 250,000 bbl. per day. Thus by 1965 the nation's petroleum deficit may amount to about 420,000 bbl. daily and increase to around 1,260,000 bbl. per day by 1975, he pointed out.

"On the basis of these forecasts, it now seems plain that the nation has at least until 1961 before it needs to turn to coal and oil shale to supply our liquid-fuel demands. There is nothing, therefore, to indicate that we should begin the construction of synthetic-fuel plants immediately."

From the economic viewpoint, Solliday declared that synthetic fuels cannot compete with those from crude oil. Referring to extensive studies made by Stanolind *(see The Oil and Gas Journal, page 116, September 15, 1949)*, he said that synthetic gasoline can be produced today from natural gas at a direct cost of 9.6 cents per gallon, from oil shale for 12.4 cents, from bituminous coal for 10.3 cents, and from subbituminous coal for 11.9 cents per gallon. These figures, however, do not take into consideration the higher investment costs, he pointed out. If synthetic plants were built using present designs, he added, the motorist would have to pay 15 to 20 cents more per gallon for synthetic gasoline than he now pays for gasoline made from crude oil.

"As long as synthetic fuels are more expensive than products from crude," he said, "there will probably be proposals to support a synthetic industry with government subsidies. . . . Our estimates indicate that investment per daily barrel of gasoline from bituminous coal would be $13,900. A daily capacity of 1,000,000 bbl. would cost the public almost $14,000,000,000, or about $100 for every person in the country. . . . In the end, the general public would have to pay that sum through increased taxes."

L. F. McCollum, president of Continental Oil Co., as he addressed the luncheon session on "Management's Frontier"

Solliday also pointed out that government subsidies would discourage initiative and could actually postpone the development of lower-cost techniques. Explaining that the science of making gasoline from coal and oil shale is now in an immature state of development, he said the nation should use the time between now and 1961 to improve present processes and lower manufacturing and investment costs. "The oil industry can accomplish these aims without government subsidy," he declared.

No Tidelands Solution

In the same general session as Solliday's address, A.I.M.E.'s national president, L. E. Young, discussed the role of the engineer. "Legal Aspects of the Tidelands Issue" was given by Carl Illig, of Humble, Houston. In the preceding luncheon session,

L. F. McCollum, president of Continental Oil Co., spoke on "Management's Frontier."

Illig reviewed briefly legal action which has taken place between the states and the Government in their fight for control of offshore oil reserves. He summed up the situation at present by saying that no solution has been reached and that wide differences of opinion exist between the proposals which have been advanced. Regarding the two bills which have been introduced in the House of Representatives, styled H.R. 5991 (the states bill) and H.R. 5992 (the government bill), he pointed out that they had certain areas of agreement.

"Under each, geophysical operations would be permitted so long as they did not interfere with lease operations; the coastal states would be permitted to apply their police powers, including the power of taxation, over the entire shelf area abutting their shores; and Texas and Louisiana would be permitted to try out their lawsuits with the United States and would be allowed any recovery they might sustain. Also, each bill contains a release of any federal claim to inland waters."

In concluding his address, Illig said: "Behind the tidelands problem and the specific proposals made for its solution lie large issues. They relate to government policy. They go to the broader question of whether the federal Government should become a superstate and the states of the Union reduced to the status of economically dependent geographic divisions without powers or resources, dependent upon the federal Government for grants-in-aid. Enactment of either Senate Bill 923 or H. R. 5992 as a solution of the tidelands problem would be a step in this direction."

Human Relations Emphasized

Continental's President McCollum in his address called for diligent study and sagacious action in management's undertaking to meet its great challenge in human relations. Concerning the employes, the consumers, and the general public, he said that management's task is to "develop the skills which will integrate the common interests of these groups and to take a position of leadership in meeting the pressing problems of the day. . . . To develop proper leadership, good management calls for the delegation of responsibility and authority."

The problems of management in the field of human relations, McCollum said, will be continuous.

"We might as well be prepared to deal with further demands for social insurance and employment stability," he said. "We shall be confronted by new problems created by increasing government intervention, by the growing political and economic power of labor unions, and by the greater responsibilities of America in the world today."

Three members of the Southwest Texas section, which was host at the San Antonio meeting. Left to right are T. S. West, of Blanco-Buchanan, head of the hospitality committee; Raoul Bethancourt, Sun Oil Co., Corpus Christi, section chairman; and W. H. Rosser, Continental Oil Co., chairman of the postconvention tour to Mexico

He advocated freedom for junior executives to make decisions "from top management to the foreman," saying that concentration of decision making in one man or a few "leads to bureaucracy and red tape" and creates mistakes, delays, and frustration.

On the other hand, he said, decentralization of management makes for a more competent leadership, frees top management from day-to-day routines, develops a maximum of initiative in the lower ranks, and thus offers a better opportunity to those "who have the desire and ability to make important contributions."

Increased attention must be given, McCollum said, to the attitudes of the general public, employes, and consumers. Thorough consideration of the interests of these groups is in "the best interest of private ownership of business," he declared.

"While every business must aim to make a profit, management should also recognize the important part played by employes, consumers, and the general public in the preservation of the profit system," he added.

Well Spacing Discussed

The technical session arousing the most discussion from the floor was that on well spacing, centering principally around the paper of C. W. Tomlinson, consulting geologist of Ardmore, Okla.

In his talk on "Lost Reserves," Tomlinson interpreted reservoir data assembled by the A.P.I. well-spacing committee to indicate larger reservoirs from close well spacing than from wide spacing. Using the basic data from the A.P.I. report, the self-styled "heretic" showed how higher recoveries per acre-foot had been obtained from closely-spaced fields than from similar widely-spaced fields. The A.P.I. report has reached the conclusion, from a study of 103 fields, that recovery is dependent on oil viscosity, reservoir-pressure decline, and formation permeability. It found no evidence that their recovery was influenced by well spacing. *(The Oil and Gas Journal, page 97, August 24, 1946.)*

Tomlinson agreed with equations of constant radial flow which indicate that little more energy is consumed in draining a large area than a small one. He pointed out, however, that in a field produced to capacity, except for a brief initial interval, oil flows more rapidly into widely-spaced wells. When this increase of velocity with increased drainage radius is introduced into radial flow equations, a corresponding increase is indicated in energy consumption per barrel of oil produced. Curtailing production does not eliminate this waste of energy, he said.

Tomlinson Paper Criticized

In the discussion that followed W. V. Vietti of The Texas Co., Houston, said in a prepared statement that Tomlinson had failed to correct for porosity and other reservoir characteristics in his comparisons of recoveries from closely-spaced versus widely-spaced fields. He also said that areal extent should have not been used as a factor, that one group of closely-spaced fields had been unduly affected by the inclusion of East Texas field on such basis.

Dr. E. R. Brownscombe of Atlantic Refining Co., Dallas, also found fault with Tomlinson's findings, as did Stuart Buckley of Humble, coauthor of the A.P.I. paper.

The Southwest Texas Section, of which Raoul Bethancourt of Sun Oil Co., is chairman, was host for the meeting. Harold Decker, Pan American Production Co., Houston, served as general chairman for the meeting.

Natural-Gas Outlook on West Coast Bright, C.N.G.A. Is Told

by Robert Harwick

LOS ANGELES.—An optimistic outlook for the future markets for natural gas and natural gasoline on the Pacific Coast was seen by the California Natural Gasoline Association at its annual meeting here October 7.

The general feeling was summarized by J. B. Taylor, president of the association, who said that California has no excess supply of natural gasoline, such as now exists in the Mid-Continent area, and there is no concern over the market prospects for the present or foreseeable future. He pointed out that natural gasoline accounts for about 10 per cent of the gasoline stocks in California, and added that the prospects for liquefied petroleum gas are good, with adequate supplies available and the future market expanding.

Fuel Oil Competitive

Natural gas has lost some markets to fuel oil, it was admitted, but this represents chiefly large industrial users equipped to burn either fuel, and the changeover has involved about 60,000 M.c.f. per day, or less than 5 per cent of the California gas market. Fuel oil becomes competitive with natural gas in California at about 90 or 95 cents per barrel, and while quoted fuel-oil prices are generally above that, some sales are being made at lower figures. However, association members declared that this situation would not retard the construction program designed to meet the gas needs of the state.

Because of the general interest in California's problem on oversupply of residual oil, two of the papers at the technical session were devoted to this subject.

A. H. Schutte, process engineer with Lummus Co., described a new contact coking process. He offered a study of product distribution and refinery economics as applied to a typical California refinery when adding contact coking to existing equipment. While the process accounts for a marked reduction in fuel oil, shows a favorable economic picture, and indicates a desirable flexibility in product distribution, additional catalytic cracking capacity is required to handle the increased production of mid-barrel distillates. No immediate solution was given as to what to do with the rather large amounts of coke produced.

A paper on "Methods of Burning Liquid and Gaseous Fuels and Stoker Firing Petroleum Coke," Otto De Lorenzi, Combustion Engineering Co., Inc., offered a possible answer for most of the coke production described by Schutte. Pictures taken of the interior of a furnace equipped with a spread stoker feeding petroleum coke indicated that this fuel could be burned in furnaces of the type generally used in oil refineries. To provide necessary flexibility, about 25 per cent of the fuel load would have to be carried by either gas or liquid fuel. Moving-picture studies were shown to illustrate the ignition and burning process of refinery tar, soda tar, gas, and acil sludge.

G. R. MacPherson and F. Sipos of California Research Corp. reported in "Effects of Natural Gasoline on Motor Gasoline Qualities." The study covered factors on which the performance of motor gasoline is dependent. Natural gasoline was shown to be useful in balancing refinery production and as an aid to the refiner in meeting gasoline specifications. It was pointed out that the use of natural gasoline in blending can be sharply limited by gasoline performance requirements which in turn are controlled by motor characteristics.

The Barnsdall Newhall-Potrero gas and gasoline plant was discussed by Melroy Welch, superintendent of gas department, Barnsdall Oil Co. The plant was built in 1948 and incorporates many unusual features new to this type of plant. Capacity is 40,000 M.c.f. per day at 450 psi. Steam is generated from waste heat, reciprocating pumps are driven with expanding gas, and L.P.G. tanks cannot run over.

L.P.G. Promotion Needed

All the papers were brought up for questions in an "Information Please" session at the close of the meeting with T. L. Taggart of Standard Oil Co. of California, as moderator. The board consisted of Coles Bason, Ingersoll-Rand Co.; Ira C. Bechtold, Fluor Corp.; Charles Day, Richfield Oil Corp.; Dr. Frank Lockhart, University of Southern California; Howard Montgomery, Warren Petroleum Co.; James Pew, Sun Oil Co.; and the authors of the papers presented at the meeting.

In commenting on the L.P.G. situation in the Mid-Continent, Pew said that the most immediate problem was one of promotion and bringing about a wider acceptance of L.P.G. in homes. He said that continuing campaign of the electrical industry for greater use of its product was having definite results, and that the L.P.G. industry would have to meet this challenge and develop a national domestic market.

Dr. Lockhart answered a question concerning the accuracy of published equilibrium factors by saying that published K values for gases other than ethane and methane were dependable up to 300 psi., fair between 300 and 500 psi., and poor over 500 psi. Values for ethane and methane are often questionable over 50 psi., he said, and to bring these values into line an additional factor involving the composition of the system must be considered.

Many of the questions concerned details of the Barnsdall plant, the contact coking process, and the stoker for burning petroleum coke. A wide interest was evidenced in the field of petrochemistry and the role that natural gas might play in the development of such processes.

A. J. Daniel Named Head of N.L.G.I. in New Orleans

NEW ORLEANS.—Arthur J. Daniel, president of Battenfeld Grease & Oil Corp., Kansas City, Mo., was elected president of the National Lubricating Grease Institute at the annual meeting of the group here last week.

The institute, which includes more than 100 manufacturers of lubricants and grease appliances, held a 3-day meeting devoted largely to technical papers on the manufacture and use of greases. Among the addresses receiving much attention was a description of the Baltimore plant of Esso Standard Oil Co. for continuous grease manufacture, presented by H. E. Bloomsburg and A. Beerbower of that company.

Another paper of wide interest was by C. W. Kelley and Norman L. Klein of the Office of Chief of Ordnance, Department of the Army, who described the Army's need for a single all-purpose grease which will meet all conditions of dust, water, wear, and extreme changes in temperature encountered in field operations. While the Army is anxious to base its procurement on commercial specifications, they said, military requirements are so exacting that a special type of grease needs to be developed.

Continental Is First to Seek Unitization in Texas

AUSTIN.—First hearing for the cooperative development of an oil field under the state's new unitization law will be held before the Railroad Commission October 18.

Continental Oil Co. has applied for unitization of the Todd Deep Cornoidal field in Crockett County. The new law authorizing unit operation became effective October 5.

WASHINGTON WATCHING

BY BERTRAM F. LINZ

No Oil Subsidy

WASHINGTON. — The Senate last week approved legislation providing a Government subsidy for marginal production of strategic minerals, but only after Senator Joseph C. O'Mahoney of Wyoming, one of its sponsors, gave assurance that no further action is contemplated extending subsidies to marginal oil production.

O'Mahoney's assurance was given after Senator Edward Martin of Pennsylvania raised the question whether the legislation might not be the opening wedge for subsidies to oil, gas, coal, and other marginal operations.

Marginal oil deposits are not to be classified as essential minerals, the Wyoming senator said, pointing out that the Government for several years has been engaged in studies of secondary methods designed to aid petroleum producers, and the synthetic-fuel investigation now being conducted also is for the purpose of dealing with the problem of future oil supply—both activities, he was quick to point out, being carried on in cooperation, and not competition, with private industry.

During the course of the debate, Sen. Henry Cabot Lodge, Jr., of Massachusetts disclosed he is working on a resolution to have a study made of what the "balance" should be between the oil we conserve in this country and supplement from foreign sources and the oil that should be produced here, pointing out that it would be just as bad to get all our oil from abroad and let our domestic sources dry up as to depend entirely upon domestic resources.

O'Mahoney agreed as to the seriousness of that problem, but said the studies of his Interior committee indicated that as discoveries are made abroad markets will be developed, making it all the more important, he said, for this country to follow an intelligent policy to bring about the exploration and development of our own resources.

Investment Guarantee

PRESIDENT TRUMAN'S "Point 4" program for assisting in the economic expansion of underdeveloped areas appears to be moving along in Congress much faster than administration officials originally anticipated.

House and Senate committees have approved legislation to guarantee private American investments abroad, and the House Foreign Affairs Committee is studying a bill to provide $35,000,000 for technical assistance in various fields.

The guarantee legislation would be administered by the Export-Import Bank, and would provide for the convertibility of profits into dollars to protect investors against blocked-exchange controls abroad and for assurance of compensation, in dollars, for any losses resulting from expropriation, confiscation, or seizure of property by foreign governments.

Some members of Congress, however, are questioning whether foreign development in some areas of industry may not spell trouble for domestic producers at some future time.

The question was raised by Rep. Omar Burleson of Texas at a recent hearing, with respect to oil, and he obtained from Commerce Secretary Charles Sawyer, who was testifying, an admission that our policy in the past of building up foreign production in anticipation of dwindling U. S. supplies may have been a mistake.

Sawyer told Burleson that fears of oil famine have receded into the far future, pushed back by the working out of methods for synthetic production and by the new discoveries in Canada.

Monopoly Study

INDUSTRY views on monopoly power and concentration of industry will be sought shortly by a House judiciary subcommittee which has been studying the problem for the past several months.

Executives of a number of major corporations have been invited to appear before the committee to discuss such questions as whether the patent laws are inconsistent with antitrust enforcement, whether tax laws can act as an inducement to limit or reduce concentration, the concentration of corporate savings and the need for controls on the size of corporations, the industry views on which can be contrasted with those expressed by Government officials at previous hearings.

The House investigation is not aimed at developing legislation this year, but two other antitrust measures which have been acted upon appear to be caught in the session-end log jam.

A Senate Judiciary subcommittee has heard testimony on a House-approved measure which would amend the Clayton Act to give the Federal Trade Commission broad power over the acquisition by corporations of the physical assets of competitors, and appears to be tied up in a controversy over the possible effects of such legislation on small companies which, for one reason or another, may have to sell out or go out of business.

The bill to permit sellers to quote delivered prices and absorb freight charges, passed by both House and Senate, has been tied up in conference for weeks, with little indication that it will be finally acted upon this year.

Dollar Is Safe

HERE'S a heartening word for those who fear the President might suddenly counter the recent devaluation of foreign currencies by cutting value of the dollar and increasing the price of gold—it can't be done.

It would take an act of Congress to carry further the devaluation of the dollar announced by President Roosevelt in 1934, when the price of gold was hiked from $20 to $35 an ounce and we got the "59-cent dollar." The legislation which authorized those changes was enacted in May 1933 and after several extensions expired peacefully in June 1943.

Since the dollar can be revalued only by act of Congress, it follows that legislation also would be necessary for any change in the dollar price of gold since any increase in the present $35 rate would directly or indirectly be a further debasement of the dollar. Such a move, however, is definitely out, since the policy of the Government has been directed primarily to maintaining a stable relation between gold and the dollar.

Oil companies operating abroad, accordingly, can continue to plan on the basis of the present dollar and, in the absence of further devaluations, its relation to other currencies.

Turbine vs. Diesel

AFTER 6 months of local road tests, the first American gas-turbine locomotive is under service tests on one of the western railroads, a 4,500-hp. oil-burner 84 ft. long which already has proved it can pull long freight trains from standstill to 70 m.p.h. in less than 5 minutes.

The gas-turbine has less efficiency than the diesel engine but has an offsetting advantage of packing more power into limited space—53 hp. per foot as against 30 hp.

A major problem yet to be ironed out is that of oil consumption, since the power plant consumes one-third

(Continued on page 178)

Olds Nomination to FPC Faces Close Vote on Floor of Senate

WASHINGTON.—A report strongly urging that Leland Olds' nomination for a third term on the Federal Power Commission be rejected was filed with the Senate last week by the interstate commerce committee, in the face of an appeal by President Truman that he be confirmed.

The committee's 10-to-2 vote, taken after receipt of a letter from the President, supported the unanimous recommendation of the subcommittee which had held hearings on the nomination.

In his letter to Committee Chairman Edwin C. Johnson of Colorado, a copy of which was sent to Vice President Barkley and at his direction read to the Senate, the President revived the charge that "powerful corporations subject to regulation" by the FPC were seeking to prevent confirmation of Olds whom he denominated "a nationally recognized champion of effective utility regulation."

Despite Truman's plea that Olds not be judged by what he said in the past, the subcommittee held that the political and economic views voiced by Olds in the 20's, when he was writing for the labor press, render him not qualified "to act in a quasi-judicial capacity in the regulation of industry."

Furthermore, wrote Johnson in reply to the President, no representatives of the corporations to which the latter referred had asked to be heard by the subcommittee, he said, "I was lobbied by numerous persons on behalf of Mr. Olds and by no representatives of any corporation opposed to him."

Subcommittee "Shocked"

"The subcommittee," he added, "was shocked beyond description by the political and economic views expressed by Mr. Olds some years ago." Excerpts from Olds' articles were quoted in which he talked of the "parasites" of capitalism, the need for labor "to seek other than constitutional processes" to better itself, nationalization of the coal industry, and the coming of communism in America.

Although Olds insisted he never was a communist and abhorred the communist ideology and had merely sought to "shock" the country into bettering the condition of labor, neither the subcommittee nor the full committee felt that he had relinquished his radical ideas.

"The committee found Mr. Olds glib of tongue, and very convincing," Johnson commented. "Like many crusaders for foreign ideologies, he has an attractive personality and is disarming to a very high degree.

"It is very distressing to me personally to oppose anyone whom you have nominated for high office and I have gone along on many occasions, but after hearing all of the testimony and reading the evidence I could not in good conscience vote to report this nomination favorably."

In the poll of the full 13-man committee, only 2 members—Senators Francis L. Myers of Pennsylvania and Warren G. Magnuson of Washington voted for Olds' confirmation. Senator Brien McMahon of Connecticut was absent and not recorded.

Because of the issues involved, the committee felt the full Senate should be given an opportunity to vote on the nomination instead of its being merely tabled, as is usual.

An adverse report on Olds by the Senate would probably mean his exit from government service, since the President would not be likely to appoint him to any other post requiring confirmation, such as the National Security Resources Board for which Olds said he had been considered. Were the nomination merely tabled, the President might give Olds a recess appointment after Congress adjourned, raising the question of confirmation again next year.

"Heat" Turned On

Following the committee's rejection of his plea, President Truman "turned on the heat," requesting the Democratic National Committee to call on its individual members and state chairmen and vice chairmen to "let their senators know" the people want Olds confirmed.

At a news conference, the President denied his action was unusual, explaining that it was a matter of party discipline to which he had been subjected many times when he served in the Senate, and laughed heartily when a correspondent reminded him there were times when he didn't "stay hitched."

Political observers in Washington questioned whether Truman had made himself any friends by cracking the whip of party discipline, pointing out that all senators voting for Olds' confirmation would thereby tacitly admit their subservience to party solidarity. There was no indication that his demand would meet with obedience from the Dixiecrats in the Senate who, with the Republicans, who are expected to stand fast with the possible exception of two or three, might prove strong enough to block the vote the President wants.

Imports Picture Reversed in August

PETROLEUM imports during August showed a drop, compared with July, while commercial exports of crude oil and products increased, according to figures of the U. S. Department of Commerce.

Exports reported by the department for August averaged 317,516 bbl. daily, or about 75,000 bbl. daily greater than July, which was the low month so far this year. Gasoline accounted for 44,000 bbl. daily of the increase after the big drop reported for July. The totals do not include shipments to noncontiguous territories for which current data are not available but in the past have averaged about 40,000 bbl. daily.

Total imports into Continental United States averaged 591,613 bbl. daily in August, a decrease of 17,267 bbl. daily from July. Receipts of foreign crude dropped 22,800 bbl. daily but products gained 5,500 bbl. daily.

Imports of crude from Venezuela averaged 255,000 bbl. daily, down 31,000 bbl. daily from the previous month.

East Coast refiners received 86 per cent of the crude with the other 14 per cent going to Gulf Coast ports.

IMPORTS INTO CONTINENTAL U. S.
(Thousands of barrels)

	August 1949	July 1949
Crude		
Mexico	731	626
Colombia	901	986
Venezuela	7,912	8,882
Kuwait	1,717	1,450
Saudi Arabia	712	849
Other	118	4
Total crude	12,091	12,797
Barrels daily	390,032	412,805
Products		
Residual fuel	5,986	5,705
Other oils	263	373
Total products	6,249	6,078
Barrels daily	201,581	196,075
Total all oils	18,340	18,875
Barrels daily	591,613	608,880

EXPORTS*
(Thousands of barrels)

	August 1949	July 1949
Crude	3,403	2,886
Gasoline	3,265	1,906
Other oils	3,175	2,752
Total all oils	9,843	7,524
Barrels daily	317,516	242,706

*Does not include shipments to noncontiguous territories which in past months have averaged about 40,000 bbl. daily

Perlman, Krug Are Targets in New Hearings on Tidelands

by Bertram F. Linz

The Supreme Court this week refused to dismiss the Government's suit for "paramount" rights in the marginal seas claimed by Texas and Louisiana but at the same time rejected a Justice Department motion for immediate review of the issue.

In the first formal action of its new term, the court gave the two states an additional 30 days in which to file answers to the Government's petition for extension of Gulf of Mexico waters of the theory of the Government's right to the offshore oil fields laid down in the California case.

WASHINGTON.—The Senate Interior Committee last week staged what amounted to a repeat performance of hearings held last August by a House judiciary subcommittee on the disposition of the California and Gulf of Mexico oil-bearing marginal seas.

The cast of characters was about the same and the testimony was practically identical, with Solicitor General Philip B. Perlman and Interior Secretary J. A. Krug carrying the ball for the Government, a number of attorneys general presenting the claims of the states, and industry witnesses, pretty much in the middle, revealing anxiety over their freedom and ability to continue offshore operations under federal management.

Briefly, the testimony boiled down to assertions by administration officials that only the federal Government can develop adequately the offshore oil fields, which it should be given as a security measure, and a counterattack by the state authorities upon both the right of the Government to seize the deposits and the claim of superiority in federal management.

No Action This Year

Since the August hearings, the House committee has made no move to send any legislation to the floor, and Chairman Joseph C. O'Mahoney of Wyoming indicated he had no intention of attempting to secure Senate consideration of the subject this year.

The committee had before it five bills, one of which—a proposal that the submerged oilfields be made a federal waterlands reserve, introduced by Senator Langer of North Dakota—is definitely not to be considered. The other bills included O'Mahoney's measure to quitclaim inland waters to the states, a bill restoring the states' title to the offshore lands, and the two measures, drafted respectively by the administration and the state officials following the breakdown of negotiations on a compromise last summer.

The hearings opened with vigorous pleas by Solicitor General Philip B. Perlman and Interior Secretary J. A. Krug for passage of the Justice-Interior sponsored bill for federal administration of the marginal seas.

Perlman let himself in for some sharp questioning when he criticized members of Congress "who preach economy on every conceivable occasion, who band together to reduce or eliminate appropriations for needed public improvements and services, but who, for some strange reason, have voted and have been ready to vote again, to give away the resources in the bed of the coastal waters."

Pointing out that O'Mahoney himself had succeeded in the last Congress in securing enactment of legislation in which the Government ceded 80 acres of federally claimed oil lands to the state of Wyoming, Sen. Sheridan Downey of California asked Perlman whether his criticism would extend to the members who voted for that measure and what, if any, was the essential difference between the cession of the Wyoming land and the restoration of title to the tidelands in the states.

The evasive response to the solicitor general finally caused Downey to discontinue his interrogation with the remark that every time he asked a question he got a lecture.

For the most part, Perlman supported the administration legislation by attacking the oil industry, which he said is back of the whole effort of the states to regain the tidelands. The states, he suggested, should be satisfied with the generous treatment accorded them by the Government, which is going to collect only the revenues taken since the Supreme Court decision in the California case June 23, 1947, when it could go back to the date of the filing of the complaint in 1945.

Critical of States

Texas and Louisiana, Perlman charged, are seeking to have the cutoff date fixed at January 1, last, "so that they can retain the funds they deliberately amassed for themselves by rushing into the execution of additional leases after they knew that they had no legal right in the property, or that any such claim by them was of exceedingly doubtful validity," leading lawyer members of the committee to point out tartly that those states were not named in the California decision and no judgment has been rendered in the cases against them, leaving them free to take the action they did "at their own risk."

Asserting that Texas has collected more than $8,000,000 and Louisiana over $12,000,000 since the decision was rendered, Perlman complained this money belongs to the United States, "assuming that the Government's contentions in the present litigation are approved by the Supreme Court."

Perlman disclosed that the administration not only is opposed to relinquishing any of the underwater oil resources to the states but does not even intend to share with them the revenues from any operations under federal control.

Perlman was questioned at length by Sen. Eugene D. Millikin of Colorado, who said that locking up reserves under "phony conservation" policies so that the oil is not readily attainable is "no protection in war."

Millikin made the solicitor general admit that there is nothing novel in the idea of the Government ceding land to states or individuals — that prior to enactment of the leasing act a wildcatter could get title to land on which he found oil, that miners can get title today, that sections of every township in public-lands states were ceded to the states for schools, and that individuals have acquired federal lands under the homestead laws.

Krug Off Easy

Krug escaped the going-over that Perlman got by stating at the outset he was not impugning the motives of anyone who didn't agree with him, and in very conciliatory terms agreed with Millikin that locked-up reserves are of no value.

But the secretary got himself into deep water, nevertheless, when he asserted that only the federal Government "has the power effectively to manage and control" the tidelands, leading Millikin to observe he is not "overimpressed with arguments that only the Government can do an effective conservation job."

Under questioning, Krug admitted he has "never been in favor of locking up oil and I don't think the Defense Department is either. What we want is to have the reserves on tap."

He admitted, however, although he said it would require decades of development, that our synthetic-fuel resources are great enough to dispose for centuries of any arguments that we will run out of liquid fuels.

Krug warned that President Truman would veto any bill giving the tidelands back to the states. He attacked provisions in the legislation

(Continued on page 178)

International

WORLD-WIDE OIL DEVELOPMENTS

Socony-Vacuum Reports Good Producer; Other Tests Watched

SOCONY-VACUUM OIL CO. of Venezuela has discovered new production in Eastern Venezuela several miles from Camiri field in the Oficina area.

The company's Morichi well tested 1,000 to 1,200 bbl. daily from both formations in a dual completion. Depth is about 7,000 ft. Production apparently is from a separate reservoir associated with the same general fault.

A survey of recent drilling operations in Venezuela and Colombia shows continued progress in several deep wildcats in Western Venezuela and two successful new wells in Colombian fields.

No additional depth has been made in recent weeks by Shell's CT-1 on the Rio Catatumbo south of Lake Maracaibo. Work on a fishing job continues at 15,637 ft. The well is the deepest yet drilled on the South American Continent.

Creole Petroleum Corp. has abandoned its Santa Cruz well east of Mara field and about 12 miles northwest of Maracaibo city. The well reached a depth of 14,045 ft., and was the deepest ever drilled by the company in Venezuela. Shell's ZC-1, another wildcat being watched with interest, is reported drilling at 13,883 ft. In Lake Maracaibo, LL 692, a Creole operation, is testing at 8,000 ft. The well is about 9 miles southwest of Lagunillas.

Recent drilling reports also showed Creole's Alturitas wildcat drilling at 12,022 ft. The well is located southwest of Lake Maracaibo.

Exploratory drilling in Western Venezuela is centered largely on finding the deep, light-oil Cretaceous pay. British-Controlled Oilfields, Ltd., has commenced its deep Cretaceous test. The well is EM 285 about ¼ mile southeast of Mene de Maurora. Latest reports have it drilling at 2,100 ft.

In Eastern Venezuela, Phillips Oil Co.'s wildcat, Santa 1, about 10 miles east of the company's new San Roque field and 5½ miles southwest of El Roble, is deepening below 10,900 ft. In San Roque field, B-7 is drilling below 7,770 ft., and B-10, drilling below 6,800 ft.

Socony-Vacuum's "tight-hole" operations in Barinas in Western Venezuela continue to hold major interest. The company recently completed Sylvester 5 and now has five or six wells in the area capable of what is rumored to be a high rate of production, though no authentic information is available.

In Colombia, Socony-Vacuum has completed an extension to the proved area in Cantagallo field. Cantagallo 12, 500 m. north of No. 6, tested more than 1,200 bbl. daily on a ½-in. choke. Gravity of the oil is 20.4°, and though the field is now producing about 1,200 bbl. daily, it was shut in for a couple of months this summer due to lack of a market outlet.

Shell's Casabe 123 is reported to have discovered a new zone in that Colombian field. The well showed for some 800 bbl. daily on a controlled test. Depth is about 5,800 ft.

New President Heads Colombia's Oil Council

J. Duque-Estrada has been named president of the National Petroleum Council of Colombia succeeding Felix Mendoza.

The council has amended its bylaws to rotate the presidency, and Duque-Estrada, an engineer, is to be succeeded by Sen. J. Jaramillo-Giraldo in January. Mendoza arrived in New York last week to discuss with Foster Wheeler Corp. the survey the company is currently making of Colombia's petroleum requirements.

Saudi Arabian Crude-Oil Output Rose in August

Crude-oil production in Saudi Arabia climbed back up in August to recover part of the sharp decline recorded in July. Arabian American Oil Co.'s August output averaged 455,282 bbl. daily, 54,280 bbl. daily above the July production.

The July decline in Saudi Arabian production was a major factor contributing to the over-all drop in foreign output in that month. *(The Oil and Gas Journal, September 22, page 145).*

Aramco reported runs at Ras Tanura in August averaged 130,005 bbl. daily. This compares to 137,194 bbl. daily processed in July. Aramco's crude production for the first 8 months averaged 487,986 bbl. daily.

Mexican Imports Rise; Costs Go Even Higher

MEXICO'S petroleum imports the first 6 months of 1949, though only about 4 per cent greater than 1948 in volume, are costing the country about 13 per cent more due to the lower value of the Mexican peso.

Mexico's total petroleum imports of all kinds amounted to 2,426,487 bbl. the first half of this year. The value in dollars was $13,542,675. This value represents an annual rate of peso expenditure 13 per cent over 1948, considering the 1948 peso at 7 to 1 and the 1949 peso at 8.65 to 1.

The first half imports, equivalent to about 13,400 bbl. daily, are slightly less than 10 per cent of Mexican consumption which in 1948 was reported at about 50,000,000 bbl. or about 137,000 bbl. daily. The country is currently producing crude at a rate of about 167,000 bbl. daily.

Owing to limitations of the transportation system, parts of the west coast and northwest border areas of Mexico are served mainly by imports from the United States. In addition, lubricants, blending stock, and specialties are not produced in the country or in insuffficient quantity.

The Mexican refining industry last year had an output slightly more than the domestic consumption. There have been indications that the changed currency rate and rising internal demand will make Mexico in 1949 a net oil importing country on a dollar-value basis.

Venezuela Gulf Refinery to Go On Stream in Summer of 1950

A COMPLETELY modern refinery at Puerto La Cruz, Venezuela, is scheduled to begin operations sometime in the summer of 1950. The plant, to have a capacity of 30,000 bbl. a day, is being constructed by Venezuela Gulf Refining Co.

As designed originally, the refinery was to have had a 20,000-bbl. capacity. However, under an agreement with Texas Petroleum Co. and its associate, Sociedad Anonima Petrolera Las Mercedes, the capacity is being increased to 30,000 bbl. Gulf's interest in the company undertaking the project is two-thirds, the other third being that of The Texas Co.

This is the first plant in which the Polyform process is to be used for the cracking of heavy gas oil with high gas dilution, which produces higher yields of higher-octane gasoline. It has been designed on the basis of results obtained from Polyform pilot plants at the Gulf research laboratories at Harmarville, near Pittsburgh.

The refinery site is on the north coast of Venezuela, in the state of Anzoategui. Principal equipment being installed includes a crude-oil distillation unit, a Polyform unit, gasoline and diesel oil treating equipment, and steam and electric generating plant.

Additional units currently under construction are a modern office building, warehouses, a quality control laboratory, necessary pump houses, and 27 storage tanks for crude oil and finished products. Of special interest is the fresh-water system. Drawn from the Neveri River at a point nearly 10 miles from the refinery, the water will be treated, settled, and filtered before it is pumped through a 16-in. pipe line. At the refinery, the water will be further treated to make it completely safe for drinking, cooking, and other community and plant uses. Storage facilities for more than 5,000,000 gal. will be provided.

Docking facilities, used by Mene Grande Oil Co., C.A., a producing Gulf company in Venezuela, for loading crude oil on tankers, will be doubled in size so that four vessels can be berthed simultaneously to take on cargoes of either crude oil or refined products. Loading pumps, pipe lines and piping on the wharf will be of sufficient size and capacity to permit vessels to load rapidly.

Output for World Markets

When in operation, the new refinery's approximate daily yield will be 11,000 bbl. of gasoline, 7,600 bbl. of No. 2 fuel oil and diesel fuel, and 10,500 bbl. of residual fuel. It is planned that the plant's entire output will be sold in world markets.

To provide accommodations for workers erecting the refinery, modern dwellings of a permanent type were built to house approximately 260 married employes and their families and 56 single employes.

This new refinery and its various subsidiary units will cost approximately $50,000,000. A comparable refining unit in the United States would cost substantially less, Gulf officials explain, because there would be no necessity for the construction of a variety of facilities which will be needed in connection with the operation of this new Venezuelan refinery.

These include roads, community buildings, two clubhouses, schools, a laundry, a commissary, an incinerator, and various other necessary buildings. These, plus the homes which are being erected for the employes and their families, are items not normally encountered in refinery construction costs in the States. In addition, it was pointed out, these costs in Venezuela are increased by the added transportation and handling charges for large quantities of construction materials, most of which must be brought to Venezuela from the United States.

Joint Supply of Crude

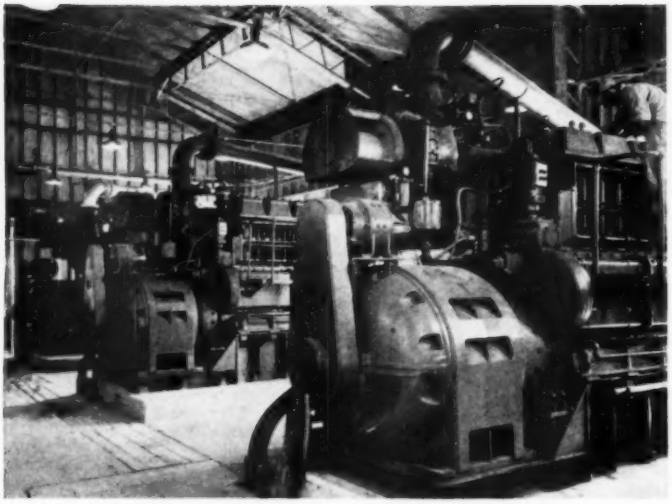
Crude oil for the new refinery will be received at a nearby tank farm through pipe lines from Oficina and other Eastern Venezuela fields. It will be provided on a two-thirds and one-third basis by the Gulf and Texas company subsidiaries. Refined products will be allotted proportionally.

From the storage tanks, the crude will be pumped through heat exchangers in the crude distillation plant to desalting equipment, where it will be emulsified with preheated fresh water. The emulsion will then be broken and water containing dissolved salts drawn off. The desalted crude will be preheated in heat exchangers and then further heated in furnaces to the necessary temperature before being discharged into the atmospheric tower. Gasoline, naphtha, diesel oil, and heavy gas oil will be recovered as distillate streams, together with reduced crude bottoms.

All distillate streams heavier than naphtha will be used for heating water or crude oil in heat exchangers. Following this, the streams—including the naphtha—will be cooled and run to storage. The reduced crude bottoms will be used for heat exchange and blending with the tar from the Polyform unit before final cooling.

The dry gas will pass to the refinery fuel system while the wet gas will be compressed and mixed with the light straightrun gasoline. After condensing, the mixture will go to the depropanizer column where any butanes not required for blending into gasoline, propane, and lighter products will be distilled off. The depropanized gasoline, after cooling, will go to the gasoline treating plant. The butanes, propanes, and lighter gases from the depropanizer will be partially condensed; the condensate will be charged to the Polyform unit, while

Work underway on forms prior to pouring concrete foundation for the cooling tower of the atmospheric still. Nearly 40,000 cubic yards of concrete will be used in the entire project. Building visible in the rear is the diesel generating plant. Tank in center at rear is for fresh water storage



One of the first buildings completed and equipped at Venezuela Gulf's Puerto La Cruz refinery was this diesel generating plant, which produces electricity needed for construction. Capable of delivering 1,500 kva., it will serve as a standby plant when the refinery is completed. Like many of the auxiliary buildings, construction is of corrugated metal siding over a steel frame

the uncondensed gases pass into the refinery fuel system.

The Polyform unit will crack the naphtha and heavy gas oil from the crude distillation plant and convert propane, and such butanes in excess of those required for blending directly into gasoline, to high-octane gasoline which can also be blended into motor gasoline. The resulting production of dry gas will be used for refinery fuel and the residuum or tar will be blended with the reduced crude bottoms from the topping plant to make salable fuel oil.

Gasoline Treating Plant

The gasoline treating plant will consist of two identical 10,000-bbl. per day units. One unit will treat the motor-gasoline stock from the crude distillation plant while the other unit will treat the motor gasoline stock from the Polyform plant.

The diesel-oil treating plants will remove any organic acids that may be in the diesel-oil distillate, and a mixing plant will combine tetraethyl lead with certain grades of gasoline to raise the octane number of the gasoline to the desired level.

All tanks at the new refinery will be constructed of welded steel, designed and built in accordance with A.P.I. standards. Stairways, gage hatches, and earthen fire walls will be provided, and cone roof tanks will be equipped with modern venting devices and flame arresters. The tanks in which the crude oil and gasoline are stored will be equipped with floating roofs; others with cone roofs.

Modern mechanical shops are to be constructed at the refinery. The buildings will be of steel frame with corrugated asbestos roofs and siding. These shops will be fitted with the required machine tools and equipment to make the necessary repairs to refining equipment.

A modern refinery laboratory of masonry construction also is planned. It will be fitted with all the necessary equipment and devices to make the various laboratory tests required to insure products of uniformly high quality.

From the standpoint of safety, both for employes and property, the refinery will be on a par with similar plants in the United States.

Lummus Co. is constructing the refinery; Chicago Bridge & Iron Co. is erecting the tanks; and Raymond-Hegeman Co. is building the house and community structures. All construction work is under the supervision of the engineering department of the Gulf Oil Corp.

Technical Conference in South America Planned

A technical conference on the oil reserves of South America will be held in Lima, Peru, in connection with the sixth meeting of the South American Petroleum Institute December 12-15.

Institute members have been asked to submit papers on: (1) estimates of reserves by countries; (2) means of increasing exploratory activities in South America; and (3) development of South American oil reserves.

International

Ultramar Says Low Oil Output Causing Crisis

ULTRAMAR OIL CO., LTD., which holds a half interest in the Las Mercedes producing area in central Venezuela, has disclosed that the company is facing a serious financial problem as a result of heavy capital outlays and a production considerably less than expected.

Ultramar and The Texas Co. each have 50 per cent interest in S.A.P. Las Mercedes which is the operating company. This constitutes the principal Ultramar asset. Las Mercedes now produces about 15,000 bbl. daily of 29°-gravity oil which is transported to the coast through the company's 157-mile, 16-in. pipe line.

In its recent annual report issued in London, Ultramar said: "It seems clear that present production is inadequate to support the capital outlay of over $70,000,000 already expended by Mercedes." The report added that, if the Mercedes operation is to become economic, a new field capable of increasing production to a profitable level must be discovered and developed. It said production for the year ended June 1949 was 5,000,000 bbl. though it had been expected to aggregate 11,000,000 bbl.

"This short-fall in expected production has reduced the revenue of Mercedes by some $12,000,000 after payment of Venezuelan royalties," the report said. "It has not only created a serious financial problem for the company but has called for a complete reassessment of the economic possibilities of the venture on the basis of present experience and such data as is available. Meanwhile, Mercedes has reduced its drilling operations with the object of keeping revenue and expenditure in balance for the time being."

The company is now attempting to work out new financing. The report added that if the company is not able to solve its financial problems, there is small prospect of its being able to maintain its investment in Mercedes.

Venezuela Plans 1950 Technical Conference

The Ministerio de Fomento of the Venezuelan Government is making plans to hold a technical conference on petroleum in Caracas sometime during 1950.

Ministry officials recently were given assurances of cooperation on the part of the operating oil companies. The conference is expected to include field visits to important oil installations.

Middle East Operations Report Released by Arabian American

International

ARABIAN AMERICAN OIL CO. has for the first time made public its annual report of operations to the Saudi Arab Government. The report covers the calendar year 1948 and various sections provide interesting information on Aramco's activities in such fields as health, transportation, housing, industrial development, and education.

As of the end of last year, Saudi Arabs made up 60.4 per cent of the company's manpower. Of 20,254 Aramco employes, Saudi Arabs comprised 12,226. Other nationalities were: American, 20.7 per cent; Italian, 6 per cent; Pakistan and Indians, 5.3 per cent; Adenese 4.8 per cent; Sudanese, 1.9 per cent, and others, 0.9 per cent.

Aramco continued to place strong emphasis on the training of Saudi Arabs to allow them to qualify for higher jobs. During the year, approximately 38 per cent of all employes on the Saudi riyal payroll received pay increases.

In the housing field, the report noted that during the year a total of 69 dormitories of 14 rooms were constructed to provide additional permanent housing for 1,932 employes. A start was made in providing houses for senior Arab employes with two dwellings completed in Dhahran.

Local Contracts Emphasized

Aramco continued to carry out its policy of providing means of enabling Saudi Arabs to participate in the industrial and business development created by the oil expansion. During the year it let 461 local contracts with a total value of about 11,500,000 riyals (one riyal equals about 30 U. S. cents). Employes of these contractors reached a total of nearly 7,000 in December. They were doing such work as building construction, operation of various kinds of equipment, servicing of airplanes and automotive equipment, and installation of utilities.

The company's medical activities were carried out by a staff of 26 doctors—12 of them American—97 nurses, and 278 hospital attendants, aid men, and other medical personnel of various classifications. The company's medical facilities gave a total of 325,922 treatments during 1948. A major program of malarial control was continued, and it was noted that November, normally the most malarious month, failed to show the expected autumn increase in cases.

In the field of education, Aramco gave trade and industrial training to 2,372 men as compared to 171 in 1947. It also expanded its program of education of American employes in colloquial Arabic.

Work undertaken by the company on behalf of the Saudi Arab Government was in three main projects. These were construction of the government's railroad and port, hydrological surveys, and agricultural projects had been increased to a total of 19. Water surveys were completed in several areas and reports submitted to the government.

The Aramco report, printed in both English and Arabic, also showed statistics and other data on the company's oil operations but most of these have been made public previously. The year's total production was given at 18,751,270 tons, 58.7 per cent over 1947. The company produced, saved, and sold 15,504,000 cu. ft. of gas upon which royalty was paid. The report noted that Aramco had extended its marketing facilities in Saudi Arabia and made dealer appointments and service station installations in seven areas.

The entire report emphasized the extent to which activities outside the strict field of oil exploration, production, and refining are involved in a development program of the magnitude of that undertaken in Saudi Arabia. It pointed out some of the ways in which the company is meeting the problems created by large-scale operations in an industrially underdeveloped but politically favorable country. It also indicated the type of investment presumably contemplated under President Truman's announced Point IV program of encouraging assistance to underdeveloped countries.

British, Dutch Open Petrochemical Plants

Important new additions to the European petrochemical industry have gone into operation recently in England and in the Netherlands.

Imperial Chemicals Industries has officially opened its new Wilton works with only the plastics division initially in production. First stage of the project is to be finished in 1953 and at that time it will have a capacity to crack some 250,000 tons of oil a year (about 5,000 bbl. daily). It will produce raw materials for plastics, soap, and other products.

In the Netherlands, Bataasche Petroleum Mij., a member of the Royal Dutch-Shell group, opened two new plants at Pernis. One is a petrochemical plant to produce materials for soaps and plastics, and the other is an addition to the Pernis refinery of the company. In a talk at the opening, J. R. M. Van Den Brink, Dutch economic affairs minister, pointed out that about 25 per cent of Netherland's oil products needs are now met by home production.

British Begin Talks on Products Price Boost

NEGOTIATIONS over increases to be made in petroleum products prices in the United Kingdom as a result of devaluation of the pound sterling have been commenced in London by oil-company representatives and officials of the Ministry of Fuel and Power.

An increase of some amount appeared to have been accepted by the government, despite its original statement that the inflationary effects of devaluation would be confined to the household loaf of bread.

The particular question was the extent of the products raise that will finally be allowed. The oil industry has asked increases of 3 pence a gallon for motor fuel and 2 pence for diesel oil. These amounts are equivalent to about 3.5 cents for motor fuel and 2.3 cents for diesel per Imperial gallon, or about 3 cents and 2 cents respectively per U. S. gallon.

At present, the retail price in London for motor fuel is 2 shillings and ½ pence (about 24 cents per U. S. gallon), and 1 shilling, 6 pence, ½ penny (about 18 cents per U. S. gallon) for commercial diesel. Increases to be allowed presumably will be on the higher dollar cost of the product at its f.o.b. point, such as Aruba, since this is the only increment affected by devaluation.

More than 25 per cent of the U. K.'s petroleum products needs still come from dollar sources, and this cost has risen 44 per cent as a result of the pound's cheaper value. In addition, sterling costs of dollar equipment and other dollar expenditures of such major British producers as Shell and Anglo-Iranian Oil Co., Ltd., have gone up similarly in Venezuela and Iran, which did not devaluate.

The British Government has prevented any quick rise in internal products prices reportedly on grounds that the companies had stocks which should be liquidated first. In London, oil-company sources said the ministry was "stalling" to forestall a rapid general rise in prices in the country.

The situation in France was much the same. The recent cabinet crisis there apparently has prevented any action on a raise in products prices, but the country buys both sterling and dollar oil.

Teapot Dome Control Turned Over to USGS

THE Navy Department this week transferred to the Geological Survey its "caretaker" responsibilities for Naval Petroleum Reserve No. 3 (Teapot Dome) in Wyoming and ordered the closing of the Naval Inspector's office at Casper, as a measure of economy.

The department explained the field has not been worked since it was turned back to the Navy in 1927 but that future plans call for the drilling of a deep test well to explore the lower geological horizons, if subsurface evidence warrants.

Geophysical tests have been under way for some time, and the transfer of the field to the Interior Department suggests that the tests indicate either that the effort does not appear worth while or the department is not optimistic over the chances of getting the necessary funds from Congress.

A joint statement by the Defense and Interior Departments denied any truth in rumors that Teapot Dome is being pumped dry as a result of drainage into the adjacent Stanolind Oil & Gas Co. field.

"An exhaustive Geological Survey study of the geological conditions in Teapot Dome, and accurate checks by the Navy of gas pressures within the reserve and of the monthly production rate of all wells within a 1-mile radius of the reserve's boundaries, have shown that no substantial quantity of oil is being withdrawn," the statement said.

Twentieth Anniversary of Van Field to Be Observed

The twentieth anniversary of the bringing in of the discovery well in Van field, Van Zandt County, Texas, will be observed October 14, in a ceremony in Van.

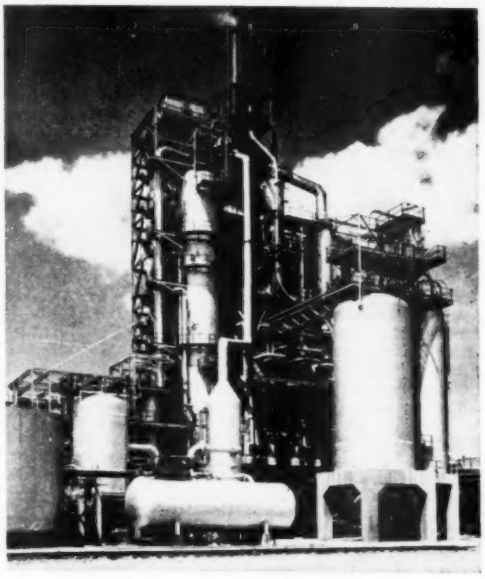
The field is one of the earliest important fields which was developed under strict conservation regulations from the beginning. At present, there are more than 600 wells in the area, and the field has an accumulated production of more than 200,000,000 bbl. Pure Oil Co. is the operator in a unit plan.

An article on development of the field will be published in the engineering section of the October 20 Oil and Gas Journal.

OGD Appoints Reeves

WASHINGTON.—Frank Reeves, wartime petroleum consultant in the foreign division of PAW and more recently engaged in gas-sand studies in West Virginia for the state geological survey, has been appointed special geological consultant to the Oil and Gas Division.

Ohio Celebrates Project Completion



Major construction project in the 2-year modernization and expansion program at Ohio Oil Co.'s Robinson, Ill., refinery was the installation of this fluid catalytic cracking unit. The unit was designed to process 12,400 bbl. of gas oil per day. The catalyst used is silica alumina and is circulated at the rate of 17 tons per minute. The modernized and expanded refinery was formally opened by the company October 5. The ceremonies were attended by more than 150 representatives of business, government, and the press who toured the plant and inspected the new installations. In addition to the cracking plant, new units included a 27,500-bbl. crude distillation unit, a catalytic polymerization unit, a gas-recovery plant, and a gasoline treating plant

Compact Sets Theme For Winter Meeting

FORT WORTH.—The contributions of pressure-maintenance and recycling operations in increasing recovery and preventing waste will be the theme of the annual meeting of the Interstate Oil Compact Commission in New Orleans December 5-7.

This theme was selected by the executive committee meeting here, and all papers, addresses, and committee reports will deal with phases of the subject. A general invitation to all persons in the oil industry to attend the meeting and participate in the discussions was extended by Gov. Frank Carlson of Kansas, chairman of the commission.

It was also decided to publish in pamphlet form the national stripper-well survey presented at the Estes Park meeting of the I.O.C.C., and to make the survey annually.

Next Week

Two new refineries.—Standard Oil Co. of California has completed a 20,000-bbl. crude unit at Bakersfield, which is the first of a three-part program to provide an entirely new refinery for serving the San Joaquin Valley. The Journal's California district editor, Robert Harwick, discusses the design and equipment.

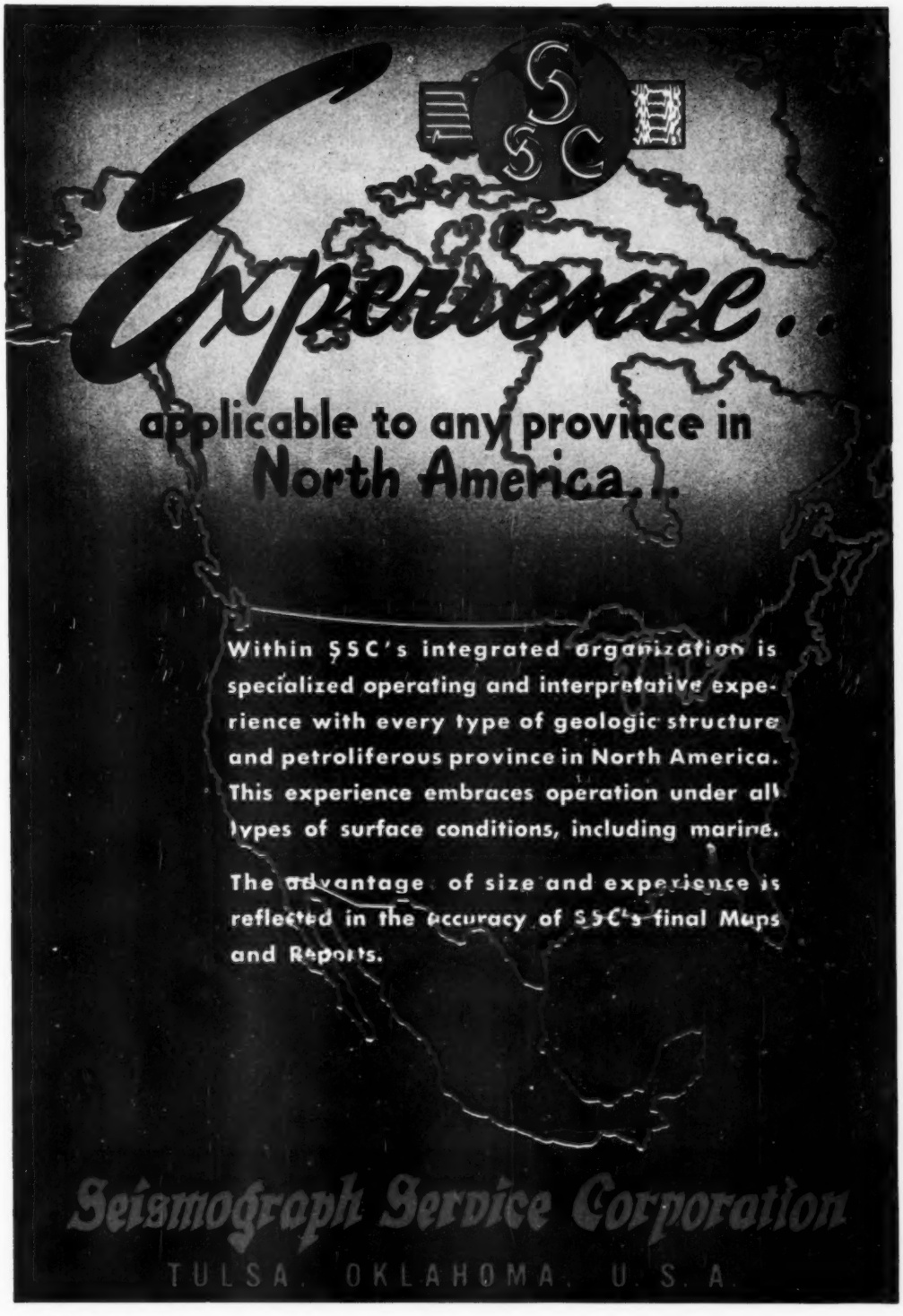
Continental Oil Co.'s eighth refinery, installed new from the ground up at Billings, Mont., is described in another feature article.

Petroleum supply-and-demand picture vs. synthetic fuels.—A fact-by-fact and figure-by-figure balancing of this matter is done by A. L. Solliday, executive vice president of Stanolind Oil & Gas Co. The paper includes a forecast, **through 1975,** of present crude production plus future additions of reserves via onshore, offshore, secondary recovery, imports, and synthetic-fuel routes.

Compressor calculations as applied to the transmission of natural gas; by Henry C. Owen, Jr., Texas Gas Transmission Corp.

Van field, Van Zandt County, Texas.—Dave Stormont, Journal district editor, gives a factual account of 20 years' performance for this model producing operation.

About C. G. Glasscock Drilling Co., Corpus Christi.—This firm has just commissioned a $500,000 submersible drilling barge, for drilling to 15,000 ft. in shallow water. The Journal's L. S. McCaslin, Jr., describes the unit's design and operating features.


Experience...
applicable to any province in North America...
Within SSC's integrated organization is specialized operating and interpretative experience with every type of geologic structure and petroliferous province in North America. This experience embraces operation under all types of surface conditions, including marine.
The advantage of size and experience is reflected in the accuracy of SSC's final Maps and Reports.
Seismograph Service Corporation
TULSA, OKLAHOMA, U.S.A.

◀ *Hycar Packing Unit*

Packing unit molded from Hycar by Kirkhill Rubber Co., Los Angeles, California *Swivel joints made by Chiksan Co., Brea, California*

How to twist a pipe, yet keep it leak-proof

TRANSFERRING liquified petroleum gas from tank cars to ships used to be a tough job. Discharge pipes couldn't be twisted or turned to hit the right spot, at just the right angle.

But an easy way to do the job was found after two tricky problems were licked. One problem went by the boards when the Chiksan Ball Bearing Swivel Joint was developed. This unique joint makes it possible to twist and turn pipe to just about any angle. The other problem—leak-proofing the joint—was solved with a packing unit made with Hycar American rubber.

The Hycar Packing Unit, a flexible seal between the metal parts, exhibits minimum volume change under service conditions. It effectively stops leakage of gas or liquid flowing from one section to another. Swivel joints are used successfully wherever gases or liquids are transferred or transported—such as refineries, chemical plants, dairies, food processing plants, bottling works and canneries.

Hycar was chosen for the leak-proofing job because it has such a wide range of qualities. It is resistant to oil and gas, abrasion, and does not flow even under extreme pressures. Hycar compounds can be varied from extremely soft to bone hard, and made in many colors.

Hycar may be just what you're looking for to answer a problem . . . to make better, more saleable products. For Hycar is used as a base material . . . as a plasticizer for vinyl resins . . . as a modifier for phenolics . . . as an adhesive base . . . as a latex for coating or impregnating. Send for complete information. Just write Dept. HE-11, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio.

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Reg. U. S. Pat. Off.
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PERSONALS

JOHN W. BRICE

M. J. RATHBONE

Brice, Rathbone Named Jersey Standard Directors

TWO new directors have been added to the board of Standard Oil Co. (N. J.), increasing the number to 14. They are John W. Brice, coordinator of producing activities of the company, and M. J. Rathbone, president of Esso Standard Oil Co.

Brice, who went to work for Humble Oil & Refining Co. 22 years ago as a geologist, has seen service also with Creole Petroleum Corp. in Venezuela, and with Carter Oil Co. He attended the University of Texas and was graduated in 1927 with an A.B. degree in geology. He joined Humble the same year and has since been continually associated with the Jersey organization and its affiliates.

In 1931 Brice went to Venezuela with Standard Oil Co. of Venezuela as division geologist. Five years later he became chief geologist. In 1937 he was shifted to New York as executive assistant to the general manager of the producing department of Jersey Standard.

He returned to Venezuela in 1939 as assistant general manager of the Jersey affiliate and in 1942 went with Carter Oil Co. as executive vice president and a director.

In June 1945, Brice went back to New York as assistant coordinator of producing activities. He succeeded L. F. McCollum, now president of Continental Oil Co., as coordinator in 1947.

Rathbone, head of Jersey Standard's principal domestic refining and marketing affiliate, Esso Standard, has had 28 years' experience with the parent company and its affiliates.

During his association with the firm he has been responsible for many innovations in petroleum refining. Born in Parkersburg, W. Va., he saw service in World War I and afterward took a degree in chemical engineering at Lehigh University in 1921. Shortly thereafter he started work in the drafting department of Standard Oil Co. of Louisiana at Baton Rouge.

He was made assistant general manager of the manufacturing department in 1933, vice president and general manager in 1935, and president of the Louisiana company in 1936. He came to New York as Esso president in 1944.

Harold S. Jones, superintendent of the South Jennings, La., recycling plant, Stanolind Oil & Gas Co., has been named superintendent of the Slaughter gasoline plant at Sundown, Tex. **Jack E. Fulgham,** who has been plant engineer at Slaughter, will become foreman there and **Kenneth L. Redman,** formerly mechanical engineer at South Jennings, will become plant engineer at Slaughter. Other changes include: **Glenn A. Ayling,** plant foreman at Slaughter, transferred to Levelland, Tex., as foreman of the gasoline plant now under construction; **R. N. Hall,** process engineer in Tulsa, moved to Levelland as plant engineer; **Norris H. Trostel,** mechanical engineer at the Luby gasoline plant near Bishop, Tex., transferred to Levelland as operating engineer; and **Lloyd E. Childers,** formerly operating engineer at the Stano gasoline plant at Ulysses, Kans., and **Arthur H. Denny,** member of the manufacturing department at Tulsa, named engineers at South Fullerton, Tex., plant, Andrews, Tex.

A. A. Hunzicker, The Texas Co., Fort Worth, has been transferred to Houston as assistant to the division manager, geophysical division, producing department. He formerly served in Fort Worth as superintendent of the geophysical division of the West Texas producing department. **J. S. Welboan,** formerly a party chief in West Texas, succeeds Hunzicker.

J. R. Chestnolvick has been named regional production engineer for Continental Oil Co. at Fort Worth, succeeding **S. V. McCollum,** who was named purchasing agent and transferred to Ponca City, Okla. Chestnolvick, who served as production engineer in Venezuela for Creole Petroleum Co., returned to the United States in June. He formerly was in the engineering department of Stanolind Oil & Gas Co. at Fort Worth before joining Creole.

M. C. Hoffman, who last June became general manager of exploration and production for Root Petroleum Co. (now Pan-Am Southern Corp.) has been elected vice president and director of Pan-Am Southern and will assume these duties as a result of the retirement of **Horace Canon** as vice president and director. Canon will remain with the company as a consultant and member of its production committee. Hoffman, a graduate of Colorado A. & M. College, served as chief production engineer for Stanolind Oil & Gas Co., Tulsa, and later as general superintendent of the company's producing department before joining Root.

M. C. HOFFMAN

Fred A. Devin, geologist for Pure Oil Co. at Tulsa, has been transferred in the same capacity to the Rocky Mountain division, headquartered at Billings, Mont.

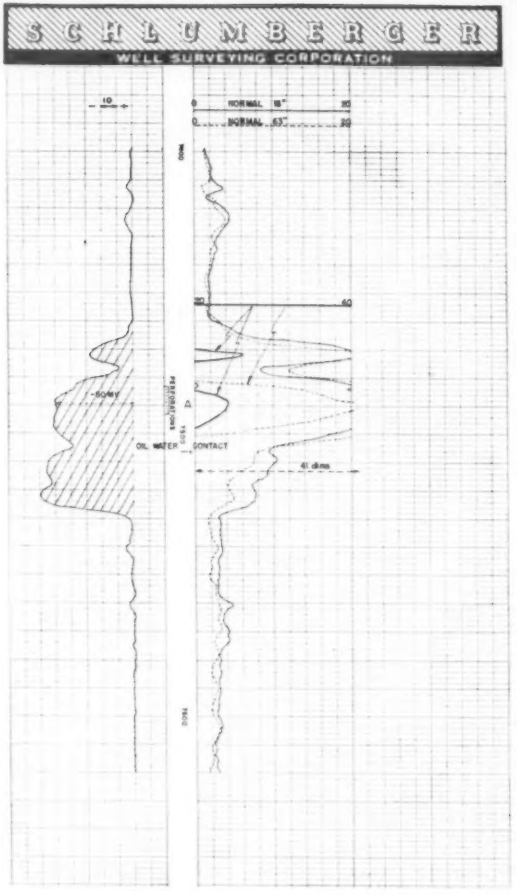
Wyatt L. Walker, formerly technologist in the catalytic cracking division, Continental Oil Co., Ponca City,

2

WILCOX SAND
BEE COUNTY, TEXAS

Mud (Water & Clay): R_m = 0.85 ohm at BHT
Bit Size: 8⅝"
Spacings: AM = 16"
AM' = 63"

This is the second in a series of interpreted electrical logs from identified formations and fields which Schlumberger will reproduce in this publication. If you would like to keep this entire series, please write to us on your letterhead and we will be glad to send you a reprint of this log (and the preceding log in this series) with a binder in which you may file subsequent logs as they are published. This series is made possible through the courtesy and cooperation of the oil operators who have released these logs.



LOG ANALYSIS

1) Water saturation S

Resistivity at water level R_o = 2.5 ohms in neighboring well.

At level A: $S = \sqrt{\frac{2.5}{41}} = 24.5\%$ approx.

2) Formation water resistivity R_w

With SP = $-70 \log_{10} \frac{R_m}{R_w} = -50$ mv.,

$R_w = 0.16$ at BHT

$F = \frac{R_o}{R_w} = \frac{2.5}{0.16} = 15.5$ approx.

3) Porosity p

$p = \sqrt[m]{\frac{1}{F}} = 25\%$ for $m = 2$

CORE ANALYSIS

Average Porosity	24%
Average Permeability	500 md.
Residual Fluids	Oil 11%
	Water 47%

PRODUCTION RESULTS

Perforated: 7483-7493 with 48 shots

Production Potential: 165 bbl. oil 42° API

SCHLUMBERGER
WELL SURVEYING CORP.
HOUSTON, TEXAS

Okla., has been transferred to the company's western region at Denver as a technologist in the manufacturing department.

J. P. Jurrius, assistant chief engineer of C.I.P.M., one of the Royal Dutch-Shell subsidiaries, has been named chief engineer of the company. The firm operates a large refinery located on the island of Curacao, N.W.I., off the coast of Venezuela. Jurrius joined the Bataafsche Petroleum Maatschappij at The Hague in 1921, and has worked in Mexico and in Venezuela. With the exception of a brief period at Cardon, Venezuela, where he was in charge of construction of the refinery then being erected, he has since 1935 been at Curacao as chief maintenance engineer and first assistant to the chief engineer.

E. L. Shafer, Continental Oil Co. engineer for the New Mexico federal unit, has been named district superintendent of the New Mexico district, with headquarters at Hobbs, N. M. He joined the company in 1935 and became engineer for the New Mexico unit in 1948.

John H. Murrell, consulting geologist for DeGolyer & MacNaughton, Dallas, has been appointed to the State Board of Registration for Professional Engineers by **Gov. Allan Shivers.** Murrell received his B.S. degree in petroleum engineering at the University of Texas, and has been a petroleum engineer since 1934.

Curtis H. Fisher, vice president of Houston Natural Gas Corp., has announced his resignation effective October 15. Since 1946 he has been headquartered in Corpus Christi where he has been in charge of the company's expansion and development program in Southwest Texas.

Clinton A. Lueth has been appointed district geologist for the Houston-Beaumont area, American Republics Corp. He was formerly with Union Producing Co. in Houston, where he studied the geology of the Texas Gulf Coast.

Henry E. McAuliffe, Jr., petroleum engineer in New York for Socony-Vacuum Oil Co., Inc., has been transferred to Socony-Vacuum Oil Co. of Venezuela.

John L. Auch, of Pittsburgh Consolidation Coal Co., has resigned to accept a position as vice president of Great Lakes Pipe Line Co., Kansas City, Mo.

E. H. Finch, geologist associated with Beers & Heroy, in Washington, D. C., has been transferred in the same capacity to the Dallas office.

C. D. Stephenson has been named vice president and **Henry C. Calhoun** has been elected manager of the land department, Southern Production Co., Inc. Stephenson joined the company in 1947 and previously was chief geologist. Calhoun joined the company in 1947, and formerly was with Carter Oil Co.

C. E. Brehm, independent oil producer, has opened a geological office in Evansville, Ind., with **A. B. Carlisle,** formerly eastern division geologist for Sohio Petroleum Co., in charge.

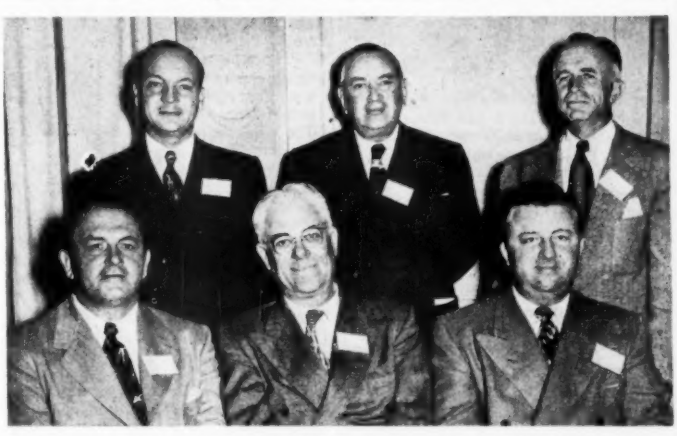
John H. Wishnick has assumed duties as manager of the oil and gas division of Continental Carbon Co., Witco Carbon Co., and Barnhart Hydrocarbon Corp., with general offices in Amarillo, Tex. **H. B. Seligman** was elected executive vice president of the latter firm.

Paul J. Natho, district superintendent at Kountze, Tex., for Pan American Producing Co., has been named district superintendent in the Pine Prairie field of Louisiana. **T. H. Sandoz,** superintendent of the Southwest Louisiana district headquartered at Easton, has been named district superintendent of the West Texas area, headquartered in Abilene.

L. B. Snedden has been transferred to Los Angeles as assistant to the division manager, Pacific Coast producing department of The Texas Co. He formerly was assistant manager of the company's geophysical division in Houston, moving there from Bakersfield, Calif., in August 1948. A graduate of Stanford University, Snedden joined The Texas Co. in 1935 as a geologist in Los Angeles and later was transferred to the Ventura district, Bakersfield, and Houston.

Marsh S. Watson, Jr., has joined The Texas Co. at New Orleans as petroleum engineer. He recently received his master's degree in petroleum engineering from University of Oklahoma, Norman. **J. B. Flugstad,** formerly district engineer at Cut Bank, Mont., for the company, has been named petroleum engineer at Denver, and **Lewis V. Roos,** seismograph party chief at Gillette, Wyo., has been transferred to the Sterling, Colo., area.

W. T. Born, Geophysical Research Corp., Tulsa, and **L. M. Hubby,** The Texas Co., Houston, have been named to the Central Committee on Radio



Five of the six new members of I.P.A.A.'s executive committee for 1949-50 are shown at the recent meeting in Fort Worth. Front row, left to right: J. Ed Warren, Midland, Tex., president of I.P.A.A.; C. H. Lyons, Shreveport; and R. L. Wood, Midland, Tex. Back row, left to right: Noble C. Ginther, Houston; Lawrence Vander Leck, Los Angeles; and J. P. Coleman, Wichita Falls, Tex. Clyde H. Alexander, Dallas, also an executive-committee member, is not shown

PERSONALS

New officers of the New Orleans Geological Society were installed last week at a meeting held in the St. Charles Hotel in New Orleans. Left to right: E. A. Gibson, secretary; A. P. Claudet, vice president; Charles DeBlieux, treasurer; and Leslie Bowling, president. The secretary and treasurer were elected immediately prior to the installation ceremonies following a constitution change which formally separated the secretary-treasurer office

Facilities, American Petroleum Institute.

George C. Wight, field superintendent in the Winkleman Dome area of Wyoming for Stanolind Oil & Gas Co., has been named assistant field superintendent of the Salt Creek area, Midwest, Wyo. Other changes include: **Lewis H. Bond, Jr.,** reservoir engineer at Longview, Tex., transferred to the Fort Worth office as petroleum engineer; and **Reid W. Cechman,** transferred from the Gorham, Kans., area, producing department, to the Stano gasoline plant near Ulysses, Kans.

W. J. Wranosky, production foreman for Magnolia Petroleum Co. at Mirando City, Tex., has been transferred to the South Freer, Tex., producing district in the same capacity.

W. Kenley Clark, district geologist at Shreveport for Superior Oil Co., has assumed duties as chief geologist of the Mid-Continent division, located in Houston.

Robert F. Boswell, petroleum engineer at Odessa, Tex., for Phillips Petroleum Co., has been transferred to Cut Bank, Mont., in the same capacity. **R. C. Cashin,** computer, has been moved from Pauls Valley, Okla., to Nocona, Tex., and **Russell L. Mayhew,** formerly construction engineer at Oklahoma City, has been transferred to Phillips, Tex., as process engineer.

Maurice Sklar, geologist for Standard Oil Co. of California working on a temporary assignment at Calgary, Alta., Canada, has completed his work and has returned to Bakersfield, Calif.

SHIFTS—

Thomas H. Walker, engineer, Magnolia Petroleum Co., San Antonio to Falfurrias, Tex.; **Richard L. Metcalfe,** engineer, Carbon & Carbide Co., Texas City to Lamarque, Tex.; **R. L. Gallaway,** engineer, The Texas Co., Jackson to Laurel, Miss.; **A. C. Hoge,** superintendent, Mississippi River Fuel Corp., St. Louis to Waynesburg, Pa.; **R. D. Cline,** superintendent, Sinclair Refining Co., Bryan to Toledo, Ohio.

Louis Taylor, geologist, Richfield Oil Corp., Long Beach to Ventura, Calif.; **Guy W. Staples,** United Geophysical Co., Inc., Taft, Calif., to Liberal, Kans.; **E. H. Griswold,** engineer, Cowles, N. M., to North Cowden, Tex.

G. De Mohrenschildt, engineer, MacKinnie Oil & Drilling Co., Whitemarsh, Pa., to Denver; **James C. Alexander,** engineer, Texas Eastern Transmission Corp., Waynesburg to Lancaster, Pa.; **W. G. Osborn,** geologist, Grant, Iowa, to Rockport, Mo.; **Mrs. Paul Swift,** geologist, Stanolind Oil & Gas Co., Lawrence, Kans., to Crystal Lake, Ill.; **Franklin A. Thurman,** geologist, Pure Oil Co., Billings, Mont., to Casper, Wyo.

DEATHS

W. L. Mellon, 81, a founder of Gulf Oil Corp. and its active head for 45 years, died in Pittsburgh October 8. He retired in 1948 as chairman of the board of directors of Gulf, but continued to serve as a director. A native of Pittsburgh, Mellon entered the oil business in Pennsylvania in 1889. He was elected a director and vice president of Gulf when it was organized and in 1909 was named president. He was elected chairman of the board of directors and appointed chairman of the executive committee in April 1931. He was also director of Ligonier Transportation Co., Ligonier Valley Railroad, Mellon National Bank & Trust Co., Monongahela Light & Power Co., and National Union Fire Insurance Co.

Dr. Robert E. Fellows, geologist of the Alaskan section, U. S. Geological Survey, died September 19 in Windy, Alaska.

George Wittmer, III, 49, formerly an independent oil operator in Fort Worth, died recently in San Jose, Calif.

Sam L. McCall, 69, independent Michigan oil producer, died in Milford, Mich., October 5. He was a co-discoverer of the Bloomingdale Traverse oil pool in Van Buren County, Michigan.

Edward W. Kolb, secretary-treasurer of Western Canada Petroleum Association, and former secretary of Alberta Petroleum Association, died in Calgary, Alta., Canada, October 1.

Charles R. Ellison, independent oil operator, Hobbs, N. M., died October 3.

H. L. Agnew, 87, pioneer West Texas oil producer, died October 2 in Ballinger, Tex.

Lewis Twyman, 56, with Arkansas Fuel Oil Co., died near Kilgore, Tex., October 2.

Olius Pierre Bourque, 54, Port Arthur, Tex., retired Gulf Refining Co. refinery worker, died recently.

Frank B. Johnson, 34, geophysicist for Humble Oil & Refining Co., Houston, died September 29.

William Nicholson, 39, with Richardson Stewart Drilling Co., died in Premont, Tex., October 1.

A Journal Report on:

World's Deepest Producer—15,250-530 Ft.

by Kenneth B. Barnes and Robert W. Harwick

WASCO, Calif.—It is impressive to stand alongside the deepest oil-producing well in the world. You listen to 265 bbl. per day of oil whistle through the side choke on the christmas tree, and then pour on to the test separators and tank battery. That oil flow started into the well from a depth just short of 3 miles down, at 15,250 to 15,530 ft. The well is a brand-new completion, and sets a substantially lower depth record mark.

This new 3-mile-deep oil well is Standard Oil Co. of California's 5 Mushrush, and it's located 4 miles west of Wasco, Calif., (pop. 5,000), in northern Kern County, or about 30 miles northwest of Bakersfield. The well is in Wasco field, which previously also has had some other superlatives in scoring depth records. Just 10 years ago the discovery well for the field, Continental Oil Co.'s A-2 Kern County Land Co., had the dual distinction of being both the deepest well ever drilled, and producing oil from the greatest depth (completed April 11, 1938).

Standard's new record holder was deepened this year from its original total depth, 13,130 ft., to 15,866 ft. The drilling was to investigate deeper horizons and work them into the producing formation, if possible, because the 13,135-ft. A-2 Lower Miocene sand, only 25 to 40 ft. thick, was nearing depletion. Standard's five wells were making a total of only 60 bbl. per day. The Continental and Getty leases had been plugged. The accompanying map shows the location of 5 Mushrush, and the structural configuration of the 13,135-ft. A-2 sand.

Standard started the deepening of 5 Mushrush last March. A company-owned heavy steam rig was moved in, with five 350-hp. boilers. A string of 9⅝-in. casing already was cemented in the well at 8,100 ft., and a 6⅝-in. string at 13,053 ft. After the well was drilled deeper to 15,866 ft., a 4½-in. liner was run from 12,964 to 15,863 ft. Top of cement was at 14,491 ft. A squeeze job was then made with 50 sacks. Water shutoff tests at 15,237 and 15,695 ft. were satisfactory.

Careful attention was paid to the mud while going down; steel pits and steel circulating ditches were used, with a degasifier and two shale shakers. Considerable coring was done, so the lower formation sands could be evaluated.

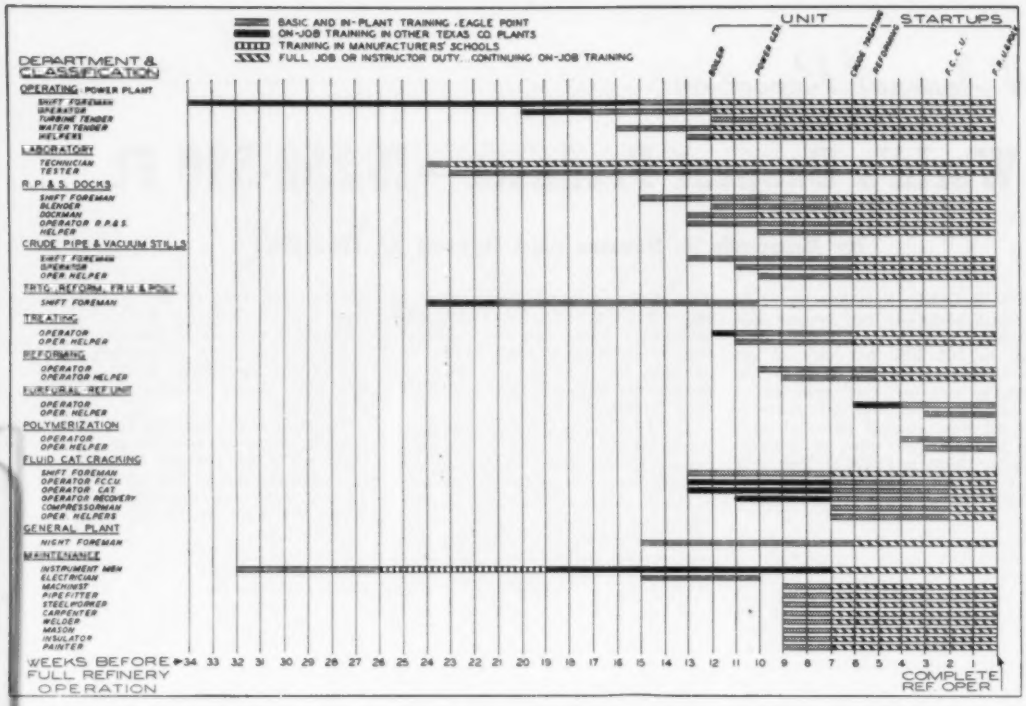
The Eocene was topped at 15,000 ft. even. Productive sand intervals indicated to be productive were jet perforated, four holes per foot, at 15,250 - 75, 15,285 - 15,310, 15,325 - 50, 15,365-90, 15,440-75, 15,495-15,530. The hole was cleared by circulating light clean mud. Standard ran tubing to 15,449 ft., with 2,460 ft. of 2-in. J-55 on bottom, then a 4½-in. 30-in.-stroke Olympic-type packer and some 2⅜-in. tubing, then 7,445 ft. of 2½-in. J-55, then 5,487 ft. of 2½-in. N-80.

Standard also tested unsuccessfully for production, by perforating and subsequent squeezing, lower down the hole before making the final completion.

The well was completed last month flowing naturally, with an early test making 375 bbl. per day. Later gages have run 265 bbl. of 43.7°-gravity oil, 2.7 per cent cut, through 20/64-in. choke, 974 M.c.f. gas. Tubing pressure runs 425 psi.

Standard still has the rig at the well, and flow tests will continue. Plans are being studied, as to further tests through the deepening of another well on the property, to the new 15,250-15,530-ft. Eocene sand zone.

Map at left shows the location of 5 Mushrush, world's deepest producer (15,530 ft.), in Wasco field, Kern County, California. Field has been producing from a Lower Miocene sand at 13,135 ft. The discovery well in that zone, a few years ago, held the distinction of being both the world's deepest well and the world's deepest oil producer. Photos at right show heavy steam rig used, and two-stage test separator hookup



Tentative training schedule, Eagle Point Works

Progressive Training Program

Conducted at New Texas Co. Refinery

by George Weber
Refining Editor

ONE of the most comprehensive training programs ever undertaken in the domestic petroleum industry is now under way at the new 40,000-bbl. Eagle Point Works of The Texas Co. This New Jersey refinery, the company's first major plant in the East, will go on stream late this year. In preparation for initial operations, a program to train all process, maintenance, and auxiliary personnel has been gaining momentum since late last year.

The core of the new refinery force will consist of key Texas Co. men who accepted transfers from several other company plants. Promotions accompanied most of these transfers and many men coming to Eagle Point are entering supervisory positions for the first time. Their preparation for new duties when the plant goes on stream, involved study of the plant and its operation, training in supervision, and instruction in methods of training new employes in lower classifications.

To supplement this core of experienced refinery men, the company is following a policy which will avoid the mass dislocation of many other employes from their present positions. Of the total expected payroll at Eagle Point, roughly 70 per cent will comprise residents of the neighboring small towns situated along the Delaware River south of Philadelphia. These new employes have been selected entirely from applicants, many of whom have had previous industrial experience. While few are familiar with petroleum refining, all are rated as well qualified to meet company standards. In fact, the caliber of this new group exceeded original expectations to the extent that the educational program has been upgraded from its initial form.

In order to prepare both the advancing company men from other refineries and the new group entering employ, a coordinated program of training was drawn up covering all personnel who will operate the new plant. The Eagle Point program differs from the continuous training conducted throughout the company's refining division mainly in its scope and its scheduling to meet a deadline date. It reflects The Texas Co.'s changing, progressive training policy in three particular points.

In the first place, emphasis at all levels is on a broad basic education in the science of petroleum refining and general plant operations to im-

In this technical training session on the fluid catalytic cracking unit, H. W. L. Enderle, foreman of the F.C.C.U. department at Eagle Point, is instructing a class of shift foremen on operation of the unit. This group also received training in job instruction of F.C.C.U. operating personnel as part of the over-all company policy of carrying out on-the-job training under foreman leadership

part perspective and job appreciation. Secondly, the program is supported with a completely documented line of texts, manuals, job breakdowns, and operating instructions. Finally, the actual instruction is designated as a line responsibility, to be conducted on a personal basis by trained operating personnel as an adjunct to their primary operational duties. These principles apply in all company refineries. They are best illustrated in the Eagle Point program which incorporates some new approaches which may find general acceptance.

Preparatory Phase

The Eagle Point program called for simultaneous training of three categories of employes; supervisors, operators, and maintenance workers. In planning the project and seeing it through its first phase ending with initial plant operation, the industrial relations department has accomplished a model program for industrial training.

Prior preparation accounted for a large share of the work. Manuals for all levels of training were prepared specifically for the new refinery. They meet not only the preliminary training requirements but will serve indefinitely as the program continues on a more stable operating basis.

Basic Refining Manual

The master text, of common interest to all employes, is the Basic Refining Manual, Eagle Point Works. A complete new work, this manual deals not only with the physical description of the plant, but includes a primer of refining operations. Its table of contents indicates the scope of material covered:

I. Introduction

II. Science and Engineering

III. Petroleum Technology
- A. Heat and Temperature
- B. Pressure
- C. Behavior of Mixtures
- D. Basic Chemistry

IV. Unit Operations
- A. Fluid Flow
- B. Heat Transfer
- C. Fractionation
- D. Absorption and Extraction
- E. Combustion
- F. Chemical Reactions
- G. Mixing and Blending

V. The Refinery
- A. Vacuum Pipe Still
- B. Fluid Catalytic Cracking Unit
- C. Thermal Reformer
- D. Catalytic Polymerization Unit
- E. Furfural Unit
- F. Treating Units

VI. Product Quality
- A. Gasoline
- B. Furnace Oil
- C. Diesel Oil
- D. Fuel Oil

VII. Plant Balance

VIII. Description of Process Units

Section II defines and discusses the basic principles and laws whose applications in the refinery are further elaborated in Section IV. Section III supplements the definitions of heat, temperature, pressure, etc., with charts and tables which not only clarify the beginner's conception of such phenomena, but serve also as working data for his continued use in better understanding his job and preparing for advancement. These supplementary data typify the content of the training material in general which provides the inquiring employe the information he needs to guide him in improving his status and becoming of further value to the company.

Section V tells what the various refinery units comprise in physical equipment while Section VIII discusses how they operate. Sections VI and VII give the employe some conception of the integration of operations on a plant scale, providing an insight into the importance of each specific job with relation to operations as a whole.

Operating Instructions

An elaboration of the basic manual is incorporated into a series of six parallel manuals entitled Operating Instructions. They detail the process divisions of the new refinery and contain all of the data necessary for operation. Appended to each are the necessary drawings, flow charts, equipment specifications and maintenance instructions. As an example, the outline of Operating Instructions for the Fluid Catalytic Cracking Unit illustrates the scope of all manuals of this class:

I. The Process
- A. Description
  Flow sheets and plot plan
- B. Discussion of Process Design
  Anticipated operating conditions, yields, regeneration and catalyst data, operating variables.
- C. Process Control

II. Preliminary Operations (initial startup)

III. Auxiliary Equipment
17 subsections each with description, drawings, and pertinent charts and curves.

IV. Starting Procedure
10 steps in full detail.

V. Normal Operation
- A. Reaction System
- B. Regenerator
- C. Precipitator
- D. Fractionator System
- E. Recovery System
- F. H_2S-Removal System

VI. Shutdown Procedure
7 steps in full detail.

Laboratory personnel received prior on-the-job training at Eagle Point to prepare for full assumption of duties when the refinery goes on stream later this year. Here Travis Nau, the head tester, is giving personal instruction to a laboratory trainee

VII. Emergencies
13 situations and how to cope with them.

VIII. Operating Calculations and Inspections

IX. Summary Sheets and Drawings

This series of manuals was prepared with the considerable aid of the contractors, licensors, and manufacturers concerned with each process section. Beyond its use in instructing new employes, this class of manual comprises the principal reference work for operators, foremen, engineers, and maintenance personnel.

Training Job Content Manuals

At the third level of training material, and of immediate interest to all trainees is the series of Training Job Content Manuals, one for each classification (operator, assistant operator, helper, etc.) in each department of each refinery unit. This manual gets down to specific cases in outlining just what the trainee must know and what he must know how to do in performing satisfactorily in his particular classification. It covers basic and on-the-job training and constitutes an outline and check list for the instructor assigned to prepare a man for the job.

Obviously, the new employe entering training without previous refining experience is not confused by exposure to excessive basic training. General information regarding operations outside his immediate sphere is added as an employe progresses to higher classifications. Thus every level of job training entails basic training sufficient for the trainee to grasp and profit from. At Eagle Point even the beginner is given some information from the pertinent manuals discussed above, in addition to the full text of his Training Job Content List.

For example, the classification of Helper; (Recovery Section) in the FCC Unit is selected to show the breakdown. His Training Job Content List cites that he "must know and be able to perform all items listed on Training Job Content of Helper (General) and Helper (Fireman) in addition to the following:

A. Basic Training
1. Flow of Fractionator and Recovery Systems
2. Flow of Foul Condensate System
3. Gland Oil Systems
4. Flushing Oil Systems

B. On-the-Job Training
1. Routine Operation
2. Startup
3. Shutdown
4. Emergencies

The section covering On-the-Job training concerns the normal operation, startup, etc., of all the following systems: fractionator, reboiler, absorber, debutanizer, rerun, and foul condensate. For basic training, simple flow diagrams of individual systems are prepared from master flow sheets and presented alone to prevent confusion. The helper in the Recovery Section, after learning the flow of each of the above systems must then learn in his on-the-job phase, the procedures necessary during normal operation, startup, shutdown, and emergencies.

Job Breakdown

As the Training Job Content tells him what he must know and be able to do, the Job Breakdown tells him specifically how every detail of his job should be done. Carrying the example further, during a shutdown the recovery section helper must know how to steam out the reboiler system. His Job Breakdown tells him precisely how:

"Steam out F-13 Drum — Admit steam through 1½-in. steam-out connection, steam overhead to slop tank and draw condensate to sewer through drain line—steam 4 hours.

"Steam out Reboiler and lines—Steam reboiler system in conjunction with heater. Steam each unit separately and route through C-80 cooling box until steam at cooling-box bleeder is dry. Steam 4 to 5 hours."

Training Job Content and Job Breakdown lists are drawn up largely by the foremen concerned, with the aid not only of their superiors, but of those employes in the classifications themselves. Thus with some coordination by the company's refining department, each job in each plant is outlined principally by those performing it and immediately supervising it.

Training Methods

To the substantial task of preparing detailed manuals on the new refinery was added the problem of planning a training schedule which would culminate with initial plant operation. This timing was necessary to assure peak efficiency for each trainee on the important startup operation. Economics also dictated that completion of training coincide with initial job performance since all employes were placed on the payroll once training began.

Obviously, the exact date of plant completion could not be fixed 8 months in advance and some revisions to the original schedule were necessary. The accompanying chart represents an example of the type of Tentative Training Schedule set up for the Eagle Point program. This master plan which shows job training for operating and maintenance personnel indicates the prior preparation required for job-instructor training.

All instruction periods for each classification were back plotted from the date of expected unit completion. Basic classroom instruction for new employes of the lower classifications was followed by in-plant training until startup day. Key operators and foremen were given operating experience in other company refineries, on units similar to those assigned them at Eagle Point. They returned for final orientation and preparation for initial operation.

Supervisor training began early since many supervisors later undertook job instruction for lower classifications. This trainee class included many experienced foremen from other company plants as well as company

(Continued on page 132)

Effect of Gravity Loads on High-Pressure Pipe Lines

by Frank W. Thompson

WHEN a heavy vehicle passes over a buried transmission line, are the stresses in the pipe increased? This question becomes of major importance where a pipe line is operated at pressures approaching yield strength of the pipe. The Michigan Public Service Commission, which has jurisdiction over matters of safety of transmission lines in that state, recently found it necessary to have experimental proof of the effect of gravity or superimposed loads in combination with internal pressures.

The pipe line for which the subject is here concerned is the Michigan portion of the Michigan-Wisconsin Pipe Line being constructed from Hugoton gas field to these two states. This part of the line extends from a point at the southern boundary of Michigan to Austin field, a distance of approximately 135 miles. The size of this portion of the line is 22-in. diameter by ¼-in. wall thickness and maximum operating pressure will be 850 psi. Specifications and operating pressure are in accordance with Division 2 of the Code for Pressure Piping.

At a public hearing, earlier this year, certain intervenors objected to the construction of the line across their farms, representing that under the proposed operation at 850 psi. and with the frequent heavy farm-vehicle loads passing over the pipe, the line would be unsafe.

At the hearing the pipe-line company submitted evidence on the construction of the line, that the steel pipe was being manufactured according to specifications, and that the line would be equal to or better than code requirements. The intervenors did not contest this contention. They did offer, however, testimony as to the weight carried by vehicles crossing the pipe line on their farms, the frequency of their operations, and the number and location of workers on the farms along the route of the pipe line.

The maximum load shown to be present was approximately 30,000 lb., which was resolved by expert engineering witnesses to be a rear-axle wheel load of 12,500 lb. per wheel. It was then developed that 10 per cent of the wheel load would be transmitted to the pipe line when there was 30 in. of cover over the pipe, which would result in additional stresses in the steel over and above that due to the internal pressure of 850 psi. It was thus represented that stresses due to the gas pressure plus the superimposed gravity load could be as much as 58,630 psi. without impact loading and 67,195 to 75,760 psi. if 150 and 200 per cent impact loadings are considered. This compares with a specified minimum yield strength of 52,000 psi. for the pipe.

Frank W. Thompson is director of public utilities for the Michigan Public Service Commission. He gained his early experience in the oil and gas fields of California, and with Los Angeles Gas & Electric Corp. In 1937 he joined the staff of California Public Utilities Commission, and following war service he was loaned to Federal Power Commission. He wrote the reports on Natural Gas Reserves of the United States, and on Practices and Problems in Producing, Gathering, and Processing Natural Gas. He received his B.S. degree in mechanical engineering from California Institute of Technology.

The transmission of surface loads to the pipe line was based upon experimental work performed at Iowa State College, which is generally accepted for the design of culverts and drains. It is noted that the stresses from gravity loads on culverts, as developed by the Iowa experiments, are without internal pressure.

There was no testimony or exhibits presented at the hearing to show that intervenors' theory and development of expected stresses were not correct. The pipe-line company, however, maintained that past experience disclosed no pipe-line failure resulting from a combination of gravity loads and internal pressure in the pipe.

Because of the lack of positive data and since the question of safety of the pipe line under the operating conditions as proposed demanded a clear answer to the question of combined stresses, the commission required the pipe-line company to perform a field test under controlled conditions simulating the maximum pressure and gravity loads which would be experienced in actual operation of the line. The commission further urged that the committee on the Code for Pressure Piping be encouraged to participate in the tests. It was also ordered that the testing procedure be

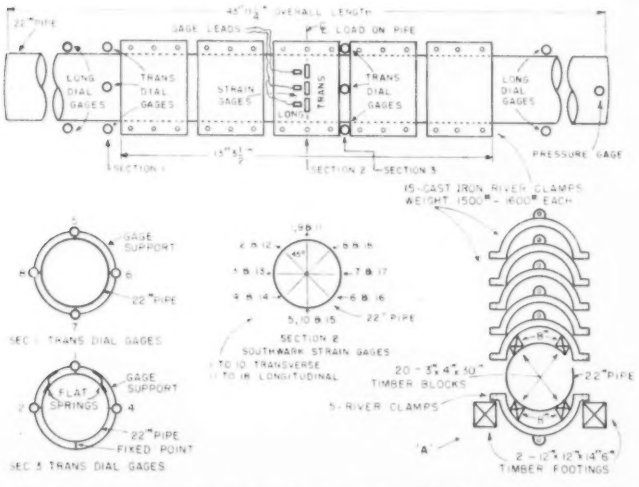


Fig. 1—Arrangement of test section showing location of loading clamps and gages

Fig. 2—River-clamp sections were used in the test for the gravity load. Dial indicators may be seen at right

subject to the approval of a member of the commission's staff.

The Test

During the commission staff's consideration of the problem, it was discussed with representatives of the American Standards Association and its Sectional Committee B-31, which had been formed for the purpose of studying possible changes in the Code for Pressure Piping. The problem was also discussed with members of the engineering department of University of Michigan and Michigan State College. It should be mentioned that the presence of representatives from the A.S.A. and Natural Gas Pipe Line Co. was unofficial and in an advisory capacity only.

Representatives of Ford, Bacon & Davis, Inc., were in general charge of the test and were responsible for constructing and installing the test section of pipe with the necessary appurtenances. Members from the engineering department of University of Michigan in the capacity of consultants were in charge of conducting the test, the taking of readings, and in the preparation and summary of data.

For the test, a typical length of 22-in. diameter by ¼-in. wall pipe was selected from stock supplies at Jenison, Mich., the location of the test. Although selection of the test pipe was somewhat at random, an endeavor was made to obtain a piece in which the wall thickness was close to the nominal of ¼ in. A short portion of each end of the pipe was removed and used for making tensile-test specimens. Welded heads were attached to the ends of the pipe-test section to form a closed vessel approximately 44 ft. in length.

This vessel was then supported above the ground in a cradle consisting of five cast-iron river clamps resting on two 12 by 12-in. timber footings. Fig. 1, a sketch of the test section, shows the method of support and the general location and arrangement of fittings. External loading was applied by placing five tiers of river clamps on the pipe. Location of these tiers is directly above the cradle supports and extends over the middle 13 ft. of the test section.

Bearing points of the clamps on the pipe are shown in "A," Fig. 1. The spacing employed was calculated to give approximately the same bending moment in the pipe as a uniformly distributed vertical load. Strain gages were located on the outside surface of the pipe at the center of the load and were spaced 45° apart, as may be noted in Section 2 of Fig. 1. Sections 1 and 3 of Fig. 1 indicate the location and manner of installation of dial gages for measuring deformation.

Fig. 2 shows the total gravity load consisting of five tiers of river clamps five high. One set of dial gages is at the near side of the clamps. It may be observed that the test section is not supported at the ends and overhangs the center supports. Internal pressure was hydraulic and obtained by a hand-operated pump. The internal-pressure gage, which was calibrated before and after the test, is at the far end of the pipe in Fig. 2.

The test was conducted in eight stages, which in chronological order, are as follows:

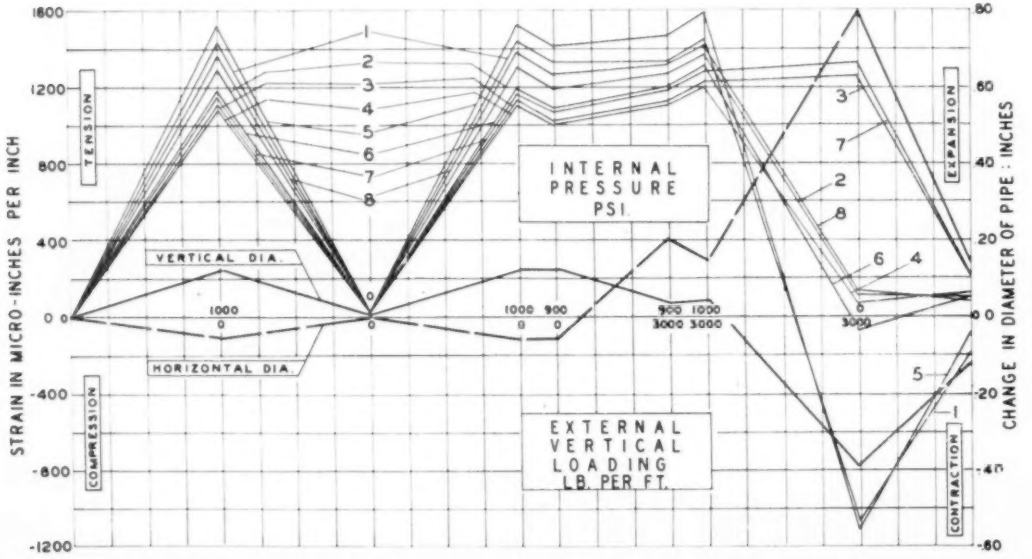


Fig. 3—Measured circumferential strains are shown by curves 1 to 8 inclusive. The lower two curves are plots on pipe deformation

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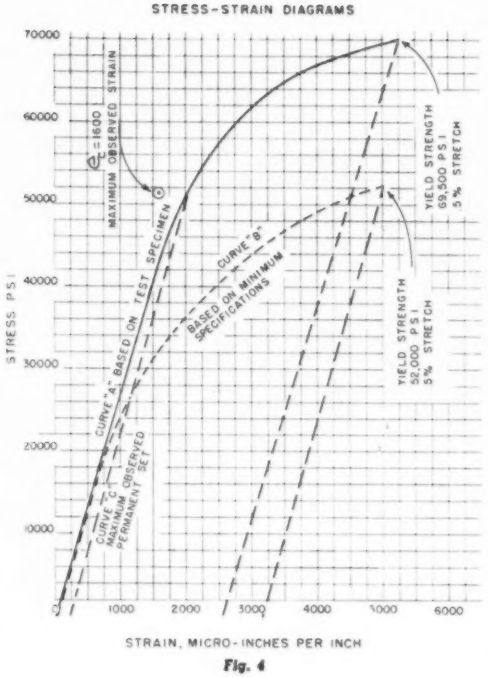

Fig. 4

1. Raise internal pressure from 0 to 1,000 psi. in 200-lb. steps with no external loading.
2. Decrease internal pressure from 1,000 psi. to 0 in 200-lb. steps with no external loading.
3. Again raise internal pressure from 0 to 1,000 psi.
4. Decrease internal pressure to 900 psi. (50 lb. over maximum operating pressure of the line).
5. Apply external vertical loads up to 3,000 lb. per lineal foot in 600-lb. steps while holding internal pressure constant at 900 psi.
6. Increase internal pressure from 900 to 1,000 psi. while holding external loading to 3,000 lb. per lineal foot.
7. Decrease internal pressure from 1,000 psi. to 0 in 200-lb. steps while holding external loading constant at 3,000 lb. per lineal foot.
8. Decrease external pressure from 3,000 lb. per lineal foot to 0 in 600-lb. steps with internal pressure 0.

Readings taken of all strain gages, dial gages, and internal-pressure gages for each of the above stages of the test constituted the official test as required by the commission.

Results of the Test

In Fig. 3 are plotted the strain gage and dial gage readings for each of the eight stages. Data on transverse strain values for eight gages located as indicated in Section 2 of Fig. 1 are plotted in Fig. 3. Gages were also installed at these locations for obtaining longitudinal strain but the readings have not been presented herein. They have been used, however, together with the circumferential strain readings to calculate stresses. Since the loads applied to the pipe are all practically within the proportional limit of the steel, the curves are virtually straight lines.

One set of curves in Fig. 3 indicate the total vertical and horizontal deformation for each of the stages. In the first stage, which consisted of increasing the internal pressure from 0 to 1,000 psi. in 200-psi. steps and with no external loading, it may be observed that there is a difference in values for the eight strain gages. Also, in the deformation curves the vertical diameter is increased about 0.12 in. while the horizontal diameter is reduced about 0.06 in. Theoretically, it would be expected for this operation that the strain gage readings around the pipe would be identical and that both vertical and horizontal diameters would increase in the same amount. The results as found are probably due to the pipe being slightly elliptical to start, with the long axis horizontal. When the full internal pressure of 1,000 psi. was applied, the pipe approached the form of a perfect cylinder. The maximum strain was 1,510 μin. per inch for gage 5 at the bottom of the pipe.

At the end of the second stage of the test, in which the internal pressure was reduced to 0 psi., there resulted a slight permanent set. This is noticeable in both sets of curves, Fig. 3. When the internal pressure was again raised to 1,000 psi. the resulting strain-gage and dial-gage readings are found to be very slightly higher than at the end of stage 1 because of the effect of the permanent set.

After the internal pressure was reduced to 900 psi. (stage 4), it was kept constant throughout the application of external loading. River clamps were then set on the pipe with one layer consisting of five clamps. These layers were built up to form a tier of five until the total load of 3,000 lb. per lineal foot had been reached.

The results of this part of the test give the answer to the original question of whether the simultaneous application of external vertical loads with internal pressure have a direct additive effect on stress and strain. It is clear that it does not.

The next step shows the effect of the external load with decreasing internal pressure. In this phase of the test, the external load was held constant at 3,000 lb. per lineal foot, while the internal pressure was decreased to 0 psi. in increments of 200 psi. The external load acting separately produces a high strain with the top and bottom of the pipe, gages 1 and 5, under compression and the horizontal sides, gages 3 and 7, in tension. The strain on the pipe at the 45° diagonals is but slightly affected.

Application of external load without internal pressure produces a flattening effect (Fig. 3) in which the horizontal diameter is shown to have increased by some 0.8 in. whereas the vertical diameter has decreased approximately 0.4 in. The fact that the contraction in the vertical diameter is approximately one-half the extension in the horizontal diameter is thought to be due to the dimpling effect on the pipe at the points of load application. Instead of the pipe being flattened somewhat evenly, as might be expected with a uniformly distributed vertical load, there results some local deformation due to the concentration of load at the four bearing surfaces. Since these points are located only 4 in. off the vertical axis, the dimpling effect tends to reduce the deformation on the vertical diameter. The completed test resulted in a permanent set which is indicated in Fig. 3.

Tabulated in Table 1 are the circumferential stresses corresponding to observed strains. These have been determined for the three extreme conditions of the test where 1,000 psi. internal pressure and 3,000 lb. per lineal foot were applied separately and in combination.

TABLE 1—CIRCUMFERENTIAL STRESSES* AT OUTSIDE SURFACE OF PIPE CORRESPONDING TO MEASURED STRAINS FOR THREE EXTREME CONDITIONS OF LOADING

Strain gage No.†	Hoop stress due to 1,000 psi. internal pressure		Bending stress due to ext. load of 3,000 lb. per lineal ft.		Measured resultant stress‡	Effective bending stress from combination loading
	Measured	Analytical	Measured	Analytical		
1	+49,236	+43,700	—37,222	—41,291	+49,364	+ 128
5	+51,403	+43,700	—35,820	—41,291	+52,869	+1,466
3	+38,401	+43,700	+41,397	+42,289	+41,684	+3,283
7	+39,963	+43,700	+43,277	+42,289	+43,022	+3,059
2	+44,297	+43,700	+ 2,996	+ 3,595	+46,687	+2,390
4	+38,305	+43,700	+ 2,040	+ 3,595	+40,600	+2,295
6	+40,632	+43,700		+ 3,595	+43,309	+2,677
8	+46,846	+43,700	+ 3,697	+ 3,595	+48,631	+1,785

*All values in psi. †For location of strain gages, 1 to 8 inclusive, see Section 2, Fig. 3. ‡Due to combination of internal pressure and external loading.

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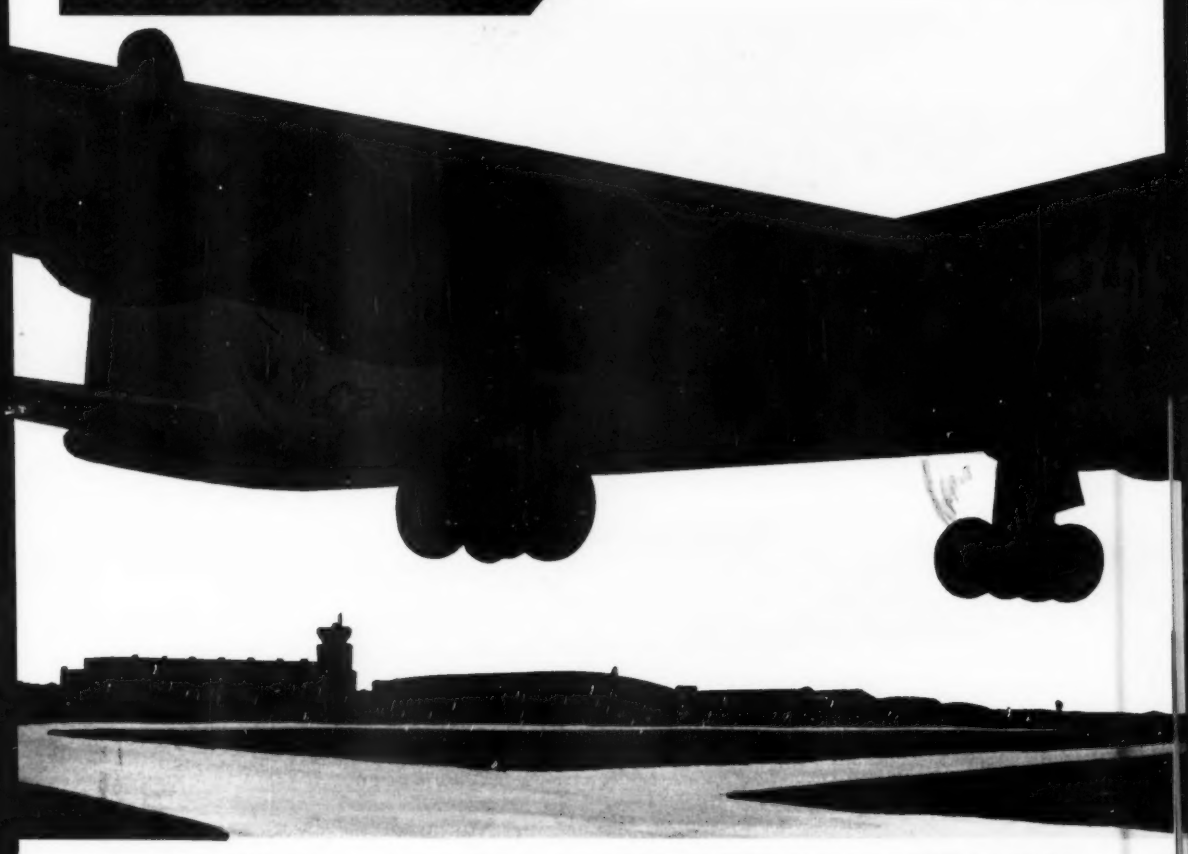

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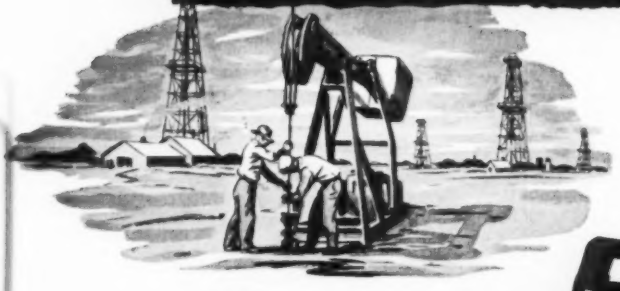

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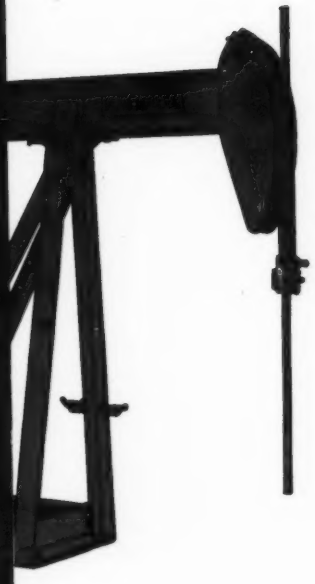

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For the hoop stress due to an internal pressure of 1,000 psi. applied separately, there is shown the transverse stresses corresponding to the measured strain at each of the indicated locations. These are compared with the theoretical or analytical stress of 43,700. The average hoop stress for the eight positions around the pipe is 43,800 psi., which is in close agreement with the analytical value. As stated before, the reason for the difference in the measured values is thought due to the pipe not being perfectly round.

In the next two columns, Table 1, are shown the measured and analytical bending stresses due to separate application of the external load of 3,000 lb. per lineal foot. Following this are given the measured resultant stresses due to the simultaneous application of internal pressure and external loading.

The last column of the table shows the effective bending stress from the combination loading. These values are determined as the difference between resultant combination stresses and hoop stress. In the case of top and bottom locations on the pipe, it would be expected that the effective bending stress from combination loading for the outside surface of the pipe would be negative instead of positive values. It is believed that this is due to a slight bulging of the pipe in the area between the load bearing points. This resulted in an additional tension at the outside of the pipe instead of a deductive compressive stress, as would normally be expected.

It may be observed that the largest value for bending stress from the combination loading occurred on a horizontal side. The analytical determination of bending stress for external load acting separately indicates that this stress would be approximately the same at the horizontal sides of the pipe as at the top and bottom except that one is in compression while the other is in tension. It appears, therefore, that the maximum stress on the walls of the pipe does not exceed the hoop stress plus 3,283 psi. and that this is applicable to either outside or inside surfaces.

It is probable, however, that there may be local stresses at the bearing points of the external loading which exceed this, but would not be considered in a uniformly distributed load such as would be expected in actual operations. It is evident from these data that the combination of the extreme test condition of internal pressure and external loading results in but a small increase in stress over the hoop stress due to internal pressure applied separately.

A plot of the calculated stress and the corresponding strain from which it was derived result very closely in a straight-line relationship, indicating that for the most part strains were

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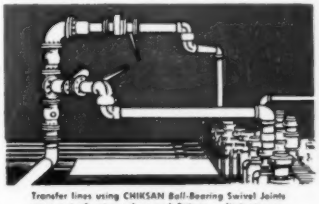
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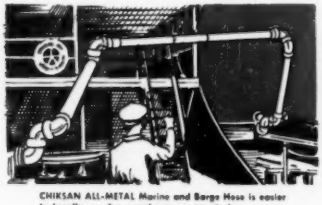
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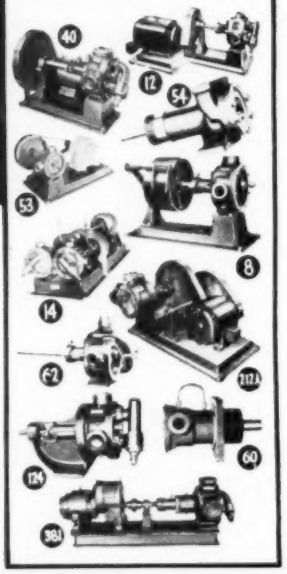

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practically within the proportional limit of the steel. The circumferential strains shown in Fig. 3 may be converted to an approximate corresponding stress by multiplying by the factor 34.4 for tension stress and by 31.9 for compression stress.

Test specimens of the pipe used in the experiment were sent to the laboratory where yield and maximum tensile strength were determined. These showed a transverse yield strength ranging from 65,500 to 69,500 psi. The test specimens taken from the ends of the pipe used in the experiment show a yield strength substantially in excess of the maximum specifications. Curve A, Fig. 4, shows a stress-strain diagram based on one of the test specimens.

Curve B of Fig. 4 shows a stress-strain curve based on the minimum specifications. Curve C indicates the observed permanent set of 223 μin. per inch which was realized from the test. This was caused by a stress of approximately 51,400 psi. and an observed strain of about 1,600 μin. per inch. From the curve the corresponding strain should have been slightly over 2,000 μin. per inch. It is believed that the lower value of 1,600 is due to the fact that during the various stages of loading and unloading the pipe was cold worked, which would result in a steeper stress-strain curve.

Summary and Conclusion

There appeared to be no evidence of observable or potential failure of the pipe after the test. The test was substantially more severe than any condition likely to be experienced in actual operations.

No attempt was made to develop theoretically the expected stresses due to combination loading. This was primarily a field test conducted under reasonably controlled conditions and with good engineering technique. It was designed to give the solution to a particular problem involving a specified set of operating conditions. It is concluded that the results have successfully accomplished this purpose. The data obtained cannot necessarily be extended to apply quantitatively to pipe lines of other sizes subjected to widely different sets of conditions. It is believed, however, that the results indicate at least qualitatively the effect of combination loading. More exhaustive tests under laboratory control would be necessary to permit formulizing.

Michigan-Wisconsin Pipe Line Co., Ford, Bacon & Davis, Inc., and the consulting engineers from University of Michigan are to be commended on the cooperative and professional manner in which this test was planned, conducted, and analyzed. It is believed to be a contribution to the industry and it is hoped that the results will be helpful to others if the problem should again arise.

The Roughness Problem

With respect to flow through commercial steel pipe and the direct solution of the Fanning equation for either the flow rate or diameter

by Oscar Wolfe

IN the foregoing sections all of the derivations have been carried through in consistent units of FLT, or the technical system. The resulting equations, therefore, are dimensionally correct and the parameters actually reduce into pure numbers, as they should.

However, the practicing pipe-line engineer, through long custom in the industry, has come to express flow rates in barrels per hour instead of cubic feet per second. Likewise, he thinks of the length of a pipe line in miles rather than in feet and pipe diameters always are expressed in inches. To make matters worse, the viscosity of crude oils usually is stated in the metric system as so many Stokes (cm^2/T), or centistokes, i.e., Stokes/100.

An equation made up of heterogeneous terms renders correct numerical results by the introduction of proper constants, but the "dimension" of the result does not come out correctly. However, pipe-line engineers are accustomed to the use of industrial units and all of the foregoing equations are, therefore, recapitulated in these practical terms.

Then by making use of the following unit dimensions:

h_f = friction head, ft.
P = pressure drop, psi.
L = length, miles
d = diameter, in.
μ_p = absolute viscosity, poises
η = kinematic viscosity, Stokes
s = specific gravity, pure number
λ = friction factor, pure number
$\alpha = (8/\lambda)^{1/2}$
Q = flow rate, bbl. per hour

the equations developed heretofore take the following forms:

(A) Solving for h_f or P:

$$h_f = \frac{80.45\,\lambda\,L\,Q^2}{d^5} \text{ (ft.)} \quad (16)$$

$$P_f = \frac{34.84\,\lambda\,sL\,Q^2}{d^5} \text{ (psi.)} \quad (17)$$

$$N_R = \frac{22.12\,Q}{d\eta} \text{ and}$$

This is Part 2 of a three-part article which began in last week's issue. The third and final part will be published next week.

$$\lambda = \phi\left(\frac{22.12\,Q}{d\eta}\right) \quad (18)$$

(B) Solving for Q:

$$Q = (\alpha/16.7)\,(P_f\,d^5/sL)^{1/2}$$

$$= (\alpha/25.4)\,(h_f\,d^5/L)^{1/2} \quad (19)$$

$$N^* = (1.327/\eta)\,(P_f\,d^3/sL)^{1/2}, \text{ and}$$

$$\alpha = \Phi(N^*) = N_R/N^* = (8/\lambda)^{1/2} \quad (20)$$

(C) Solving for d:

$$d = (34.84\,\lambda\,sL\,Q^2/P_f)^{1/5}$$

$$= (80.45\,\lambda\,L\,Q^2/h_f)^{1/5} \quad (21)$$

$$N_D = (8.2/\eta)\,(P_f\,Q^2/sL)^{1/3}$$

$$= (6.94/\eta)\,(h_f\,Q^2/L)^{1/3} \quad (22)$$

and

$$N_R = \psi(N_D)$$

which gives λ from Figs. 4 and 2. *(See last week's installment for figures.)*

The Effect of Roughness

Dimensional considerations which were developed in the section above can be extended to show that the expression $\tau_0/\rho V^2 = \lambda/8$ is a function not only of the Reynolds number N_R, but also of an additional parameter, namely, the relative roughness of the pipe wall which is characterized by e/D, the relative roughness. This is confirmed by the observation made long ago that the flow capacity of a water line, for instance, diminishes with age on account of the gradual roughening of the pipe wall due to tuberculation.

A most important series of tests regarding the effect of roughness on flow through pipes was made by Nikuradze on artificially roughened pipes at Gottingen and reported by him in 1930 and 1932.*

In order to obtain interior pipe walls of known relative roughnesses which are geometrically similar, one with the other, he coated the pipe walls with sand grains of known

*Gesetzmassigkeiten der turbulenten Stromung in glatten Rohren. VDI. Forschungsheft 356, 1932. Widerstandsgesetz von turbulenten Wasserstromungen in glatten und rauhen Rohren. 3. Int. Kongress fur tech. Mech., Stockholm, 1930.

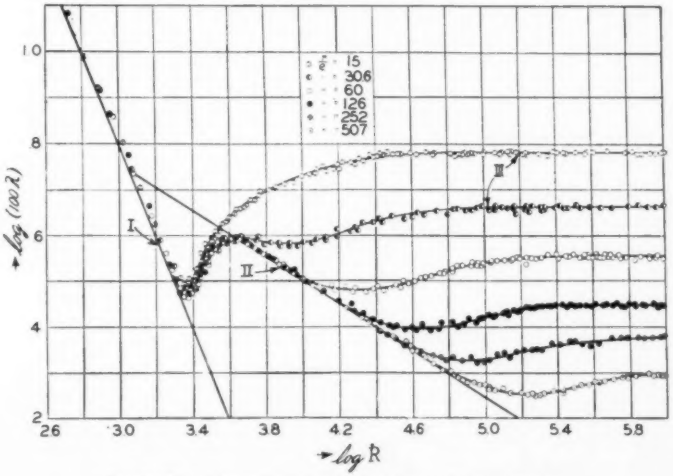

Fig. 5—Illustrating successive forms of flow. (After Nikuradze)

diameter. Pipe diameters used by Nikuradze ranged from 2.4 to 9.94 cm. and the ratios of pipe radius to absolute height of roughness elevation at the wall from a value of 60 to as high as 507.

By plotting the experimental values to the λ vs. N_R relationship, he obtained a well-known set of curves which have often been quoted in the literature (Fig. 5).

Nikuradze observed that "if we examine the curve for a given relative roughness, we can distinguish three different ranges. Within the first range, i.e., at small Reynolds numbers, the roughness is seen to have no effect on the resistance. In this range the curve $\lambda = \phi(N_R)$ for each value of (r/e) coincides with that for smooth pipe over the entire streamline regime and into part of the turbulent region, to an extent which is the greater as the relative roughness of the pipe wall becomes less.

"In the second, or transitional, region the effect of roughness is indicated by the fact that the friction factor λ increases with the value of N_R, which means that it is influenced both by the roughness and by the internal agitation of the fluid which is characterized by N_R.

"Finally, in the third region the friction factor is independent of N_R. In this range, the value of λ remains constant and, thus, gives rise to the quadratic resistance law."

While it is apparent that the λ vs. N_R diagram for pipe artifically roughened with sand grains is of no immediate use for predicting the behavior of commercial steel pipe under like pressure conditions, the data revealed by the Nikuradze tests nevertheless provide the foundation for the Prandtl and von Karman theories for turbulent flow which enable us to estimate the effect of roughness on flow through commercial steel pipe.

These theories are predicated, in part, on the existence of a laminar film which even under conditions of highly turbulent agitation in the central portion of the pipe, clings to the pipe wall and within its boundary transmits the motion of the fluid according to the laminar flow regime, characterized by the equation $\tau = \mu \frac{dv}{dy}$.

The existence of this laminar layer has been verified experimentally and its thickness δ is known to decrease with an increase in the value of N_R for the flow conditions existing in the pipe.

The behavior of this laminar film, thus, provides a measure which determines whether a surface under a given flow condition is to be regarded as either smooth or rough.

A. Smooth Pipe

If the laminar film thickness δ is greater than the height of the protuberances from the pipe wall, roughness has no effect upon the resistance of flow and the wall under this condition is regarded as smooth.

Fig. 6—Laminar film thickness, smooth pipe

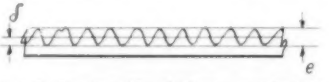

Fig. 7—Laminar film thickness, rough pipe

B. Rough Pipe

On the other hand, if the flow conditions in a pipe and the viscosity of the flowing fluid cause the laminar film to have a thickness which is less than the average height e of the wall surface profile, then the roughness effect predominates and flow proceeds under the quadratic resistance law where λ has a constant value. When this occurs, the flow is regarded as wholly rough.

C. The Transition Region

If the flow conditions are such that $e = \frac{1}{4}\delta$, i.e., the laminar film thickness is of the same magnitude as the mean roughness elevation and then the flow conditions are changed so as to be represented by a greater N_R, more and more of the individual protuberances will emerge through the laminar film and, thus, gradually change the flow regime from one that is smooth into one that is wholly rough. Over the range of Reynolds numbers during which this emergence takes place, flow is regarded as being in the transitional phase. As a matter of fact, turbulent flow in a steel pipe usually falls within this range. However, the transition range for steel pipe is quite different from the pattern exhibited by Nikuradze's artificially roughened pipe.

The Laminar Film

In the laminar layer there is no room in which crosscurrent motion can develop due to the proximity of the pipe wall. It has long been recognized that within this layer, the motion proceeds according to the streamline regime governed by the relation $\tau = \mu \frac{dv}{dy}$.

This means that the velocity distribution is a line of uniform slope, beginning with the value of zero at the pipe wall and ending with the so-called "wall velocity," v_w, at the boundary between the laminar film and the central turbulent region of the pipe section.

Then, remembering that

$$(\tau_w/\rho)^{1/2} = v^*$$

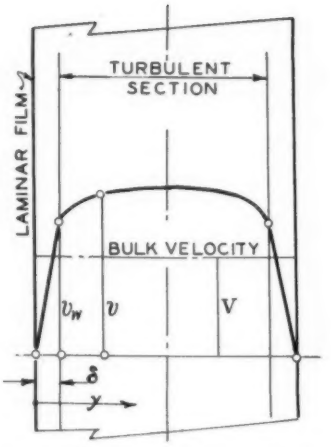

Fig. 8—Turbulent flow pattern velocity distribution in laminar film

we can develop the following relationships:

$$\tau_w = \mu \frac{dv}{dy}$$

hence

$$\frac{dv}{dy} = \frac{\tau_w}{\rho}\frac{\rho}{\mu} = \frac{v^{*2}}{\nu} = \frac{v_w}{\delta} \qquad (23)$$

and

$$\delta = (\nu/v^*)(v_w/v^*) \qquad (24)$$

From (23) it also follows that:

$$\tau_w = (\mu/v)\, v^{*2} = \rho\, v^{*2}$$

and for $0 < y < \delta$:

$$\tau = \mu\,(v/y) = \rho\, v^{*2}$$

hence

$$\frac{v}{v^*} = \frac{\rho\, y\, v^*}{\mu} = \frac{y\, v^*}{\nu} = \frac{y}{D} N^* \qquad (25)$$

Since v^* is known to have the dimension of velocity, the two sides of this equation represent pure numbers. For $y = \delta$ this last equation becomes:

$$\frac{v_w}{v^*} = \frac{\delta}{D} N^* \qquad (26)$$

Experimental data confirm the interesting fact that just as $N_R = 2{,}500$ characterizes the transition point between the laminar and turbulent flow regimes so does the expression in Equation 26, likewise, have a definite value for the laminar film thickness δ, namely:

$$\frac{\delta}{D} N^* = 11.6 \qquad (27)$$

(See Fig. 11)

The Turbulent Velocity Distribution Curve

At this point it is well to call attention to the important fact based on the observations made by Fritsch* that for a fluid passing through a conduit under the turbulent flow regime, the shape of the turbulent core of the velocity distribution curve is independent of the well roughness and the average flow rate while τ_o or, in other words, the pressure gradient $p/l = 4\tau_o/D$ remains constant. The experimental evidence thus points in the direction that the effect of a change in wall roughness is limited to the laminar film immediately next to the wall.

This may be visualized schematically as in Fig. 9. In this diagram m′ — d is the turbulent portion of the velocity curve which remains the same while the flow rate undergoes a change due to an increase or a decrease in the pipe wall roughness.

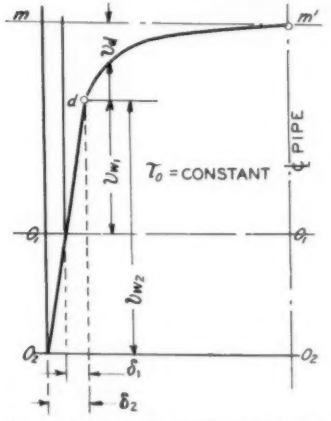

Fig. 9—Flow pattern for constant resistance and variable discharge. (After Bakhmeteeff†)

Within the laminar film, the velocity gradient is known to be a straight line with the slope $v_{w_1}/\delta_1 = v_{w_2}/\delta_2$ (Equation 23) which does not change its value so long as τ_o remains the same. But practical experience also shows that for a given pressure drop the flow rate diminishes if the wall roughness is increased and, obversely, goes up if the roughness is decreased. Therefore, the conclusion is clear that any increase or decrease in the flow rate (average bulk velocity) caused by a change in roughness at the wall, is made at the expense of the laminar film thickness δ.

Under actual flow conditions such a change in laminar film thickness takes place by moving the laminar boundary further into the turbulent area. However, this minute shift of point d (Fig. 9) may be disregarded for all practical purposes.

The velocity distribution pattern outlined above forms the basis for von Karman's theory‡ according to which he reduces the roughness problem in turbulent flow into one unified pattern for all degrees of roughness.

By basing his deductions on the Nikuradze test results, von Karman succeeded in establishing an equation for the turbulent portion of the velocity distribution curve which is valid for all pipe diameters and all degrees of roughness. He accomplished this by choosing as coordinates the terms y/r_o and $(v_{max} - v)/v^*$, both of them dimensionless. In order to be independent of the wall velocity v_w which changes with increasing or decreasing wall roughness, the coordinate base for this equation has been laid in line m — m′ which passes through the point of maximum velocity at m′, as shown in Fig. 10. This equation, known as the "velocity deficiency law," is:

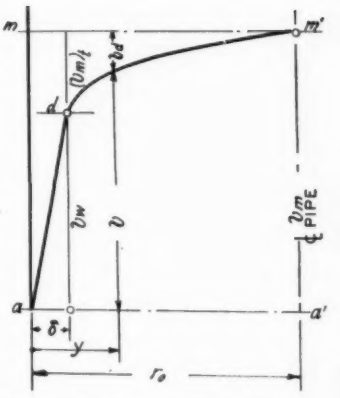

Fig. 10—Velocity distribution curve, turbulent flow

$$\frac{v_m - v}{v^*} = -\frac{1}{k}\left[\log_e\left(1 - \sqrt{1 - \frac{y}{r_o}}\right) + \sqrt{1 - \frac{y}{r_o}}\right]$$

in which $k = 0.4$ is a universal constant.

A somewhat simpler expression which fits the velocity deficiency curve equally as well was suggested by Prandtl in the form:

$$(v_m - v)/v^* = (1/k)\log_e(r_o/y)$$

$$= (1/0.4)\log_e(r_o/y) \quad (28A)$$

or

$$(v_m - v)/v^* = v_d/v^*$$

$$= 5.75\log_{10}(r_o/y) \quad (28)$$

A. Smooth Pipe

At the boundary between the laminar film and the turbulent section (point d in Fig. 10), Equation 28 becomes:

$$v_w/v^* = v_m/v^* - 5.75\log_{10}(r_o/\delta)$$

But, according to Equations 26 and 27:

$$v_w/v^* = (\delta/D)\,N^* = 11.6$$

and therefore

$$v_m/v^* = 11.6 + 5.75\log_{10}\left(\frac{D\,N^*}{23.2\,D}\right)$$

$$v_m/v^* = 3.75 + 5.75\log_{10}N^* \quad (29)$$

and combining (28) and (29):

$$v/v^* = 5.5 + 5.75\log_{10}(y\,N^*/D) \quad (30)$$

We are now in position to determine the entire velocity distribution curve for a fluid of known physical characteristics which flows through a circular, **smooth-wall** pipe at a given pressure gradient. Thus, by referring again to Fig. 10, we have for:

$0 < y < \delta$:

$$v = v^*\,y\,N^*/D \quad (25)$$

$\delta < y < D/2$:

$$v = v^*\,[5.5 + 5.75\log_{10}(y\,N^*/D)] \quad (30)$$

$y = D/2$:

$$v_m = v^*\,(3.75 + 5.75\log_{10}N^*) \quad (29)$$

In the next following Fig. 11, these results are verified by a diagram based on the Nikuradze tests. It will be noted that the common point between the laminar film and the turbulent center portion of the velocity curve occurs at $(y/D)N^* = (\delta/D)N^* = 11.6$. Refer to Equation 27.

Velocity Distribution Law in Terms of Average or Bulk Velocity

The velocity deficiency equation may be expressed in terms of V, the average or bulk velocity of the fluid, by observing that in Fig. 12 $V_d + V = v_m$ and by integrating the following expression which is self-evident, namely:

Deficiency volume

$$= \int_{\delta}^{r_o}(v_m - v)\,dy\;2\,(r_o - y)\,\pi$$

in which

$$v_m - v = (v^*/k)\log_e(r_o/y)$$

(See Equation 28A)

For all practical purposes, the lower

*Fritsch "Abhandlungen aus dem Aerodynamischen Institut der Technischen Hochschule Aachen." Heft 8.

†Bakhmeteeff "Mechanics of Turbulent Flow," Princeton University Press—1941.

‡"Mechanische Ahnlichkeit und Turbulenz," Nach. Ges. Wiss., Gottingen, 1930.

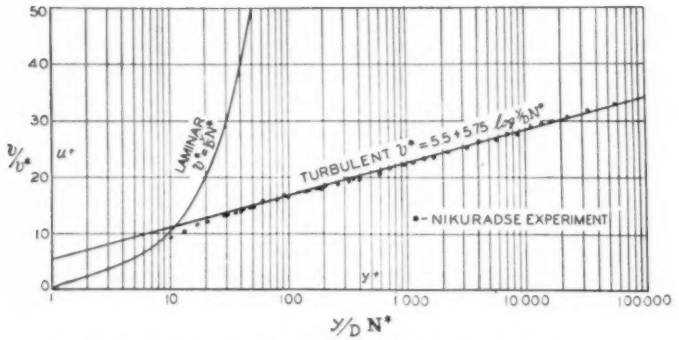

Fig. 11—Proving the velocity distribution law (abscissae in logarithmic scale)

limit δ may be taken as zero, and the integration then produces:

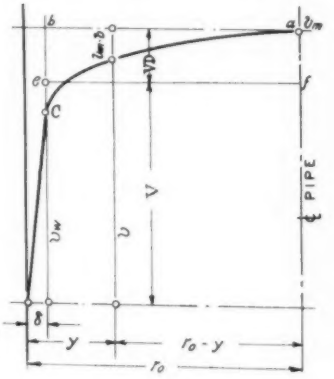

Fig. 12

Deficiency volume

$$= (3\,r_o^2/4)\,(2\pi\,v^*/k) = r_o^2\pi\,V_D \therefore$$

$$V_D = (3/2)\,(v^*/k) = v_m - V$$

so that

$$(v_m - V)/v^* = 3/2k = C = 3.75 \quad (31)$$

$$V/v^* = v_m/v^* - C \quad (32)$$

But according to Equation 29, we have determined that:

$$v_m/v^* = 3.75 + 5.75 \log_{10} N^* \quad (29)$$

and also:

$$V/v^* = \alpha \quad (5)$$

so that by combining with Equation 32 above, we get:

$$\alpha = 5.656 \log_{10} N^* + 0.294 \quad (33)$$

which reflects a slight modification of C for better correlation with the Nikuradze test results, as shown in Fig. 13.

Example: Assuming that oil of ρ = 1.65 and viscosity of μ_{GR} = 0.000177 G-Rheyns is flowing through a **smooth** circular pipe of 1.021 ft. inside diameter and at the rate of

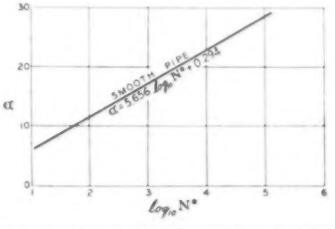

Fig. 13—Smooth pipe law. (After Prandtl)

4.685 cu. ft. per second, or V = 5.72 ft. per second. The length of the pipe is 264,000 ft. With the velocity given,

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the pressure drop is found by the customary method:

$$\frac{DV\rho}{\mu} = \frac{1.021 \times 5.72 \times 1.65}{0.000177} = 54{,}450$$

and

$$\lambda = 0.0205 \text{ (smooth pipe) and}$$

$$p = \frac{\lambda l \rho}{D} \frac{V^2}{2}$$

$$= \frac{0.0205 \times 264{,}000 \times 1.65 \times 5.72^2}{1.021 \times 2}$$

$$p = 142{,}500 \text{ psf.}$$

But, supposing the pressure drop were given and not the flow rate, then:

$$N^* = \frac{1}{2\nu} \sqrt{\frac{pD}{l\rho}}$$

$$= \frac{1}{2 \times 0.0001073} \sqrt{\frac{142{,}500 \times 1.021}{264{,}000 \times 1.65}}$$

$N^* = 2{,}752$ and according to Equation 33:

$$\alpha = 5.656 \log_{10} N^* + 0.294 \quad (33)$$

$$\alpha = 5.656 \log_{10} 2{,}752 + 0.294$$

$$\alpha = 19.74 = (8/\lambda)^{1/2} \therefore$$

$\lambda = 0.0205$ which agrees.

Ohio Oil Formally Opens Expanded Plant

THE modernized and expanded Robinson, Ill., refinery of Ohio Oil Co. was formally opened by the company October 5.

J. C. Donnell, president, members of the board of directors, and other company officials were in Robinson to meet business, industry, government, and press representatives invited to inspect the new refining facilities.

Construction in the modernization program was begun early in 1947 and completed this summer. Major project was the installation of a catalytic cracking unit designed to process 12,400 bbl. of gas oil per day.

Other major units added include a 27,500-bbl., two-stage crude distillation unit, a catalytic polymerization unit, a gas-recovery plant, and a gasoline-treating plant.

The expansion program also included a major addition to the power plant, a new water-circulating pump house and cooling tower, an Ethyl-blending building, and an A.P.I. oil separator.

Ohio purchased the Robinson refinery in 1924 when the plant had a capacity of only 750 bbl. daily. It underwent its first major expansion and modernization program in 1927.

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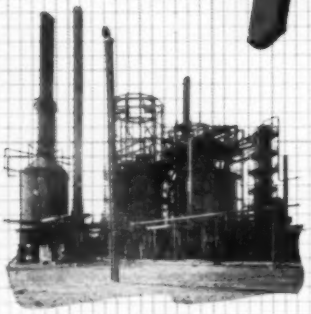

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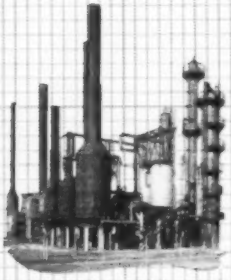

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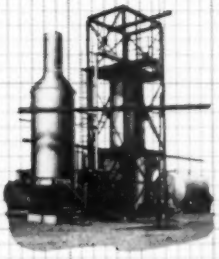

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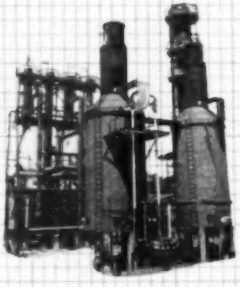

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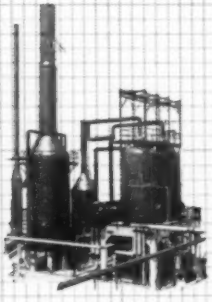

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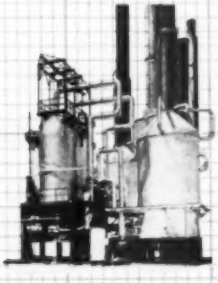

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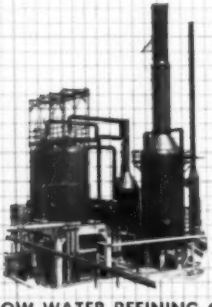

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CONTROL SYSTEMS FOR DISTILLATION TOWERS

by Cyrus Pyle*

THERE are many types of control systems which can be utilized to operate a distillation tower. While all will work to some degree, each appears to have specific limitations, advantages, and disadvantages.

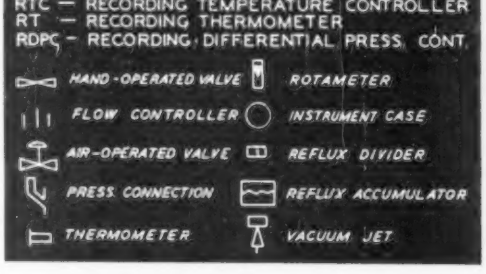
Any analysis of the various control systems should take into account the behavior of the tower itself as a fractionating device, and the effect of the control system on fractionating capacity. It does not appear that such an analysis has heretofore been attempted, but in so doing it is necessary to consider the internal workings of the tower, as well as the fundamentals of design. This discussion treats with continuously operating towers, although the general principles developed are applicable to towers employed in batch service.

Before selecting a system for controlling the operation of a fractionating tower, it is essential to know that the tower itself has been properly designed to do the job desired. If this condition is fulfilled, the problem resolves itself into one of making the tower operate in the fashion intended by the designer. The elements which are susceptible to control on an operating tower are shown in Fig. 1.

It should be stated at this point that a tower should function smoothly and uniformly. There are usually several controllers on a single tower and they must all work in harmony. Any sudden change may start an instrument cycling, and if the off-on type of controller is used, it will not be long until it is difficult to operate the tower at all.

Atmospheric Towers

The first consideration is control of feed to the tower. To maintain the tower in continuous balance, it is essential to keep the rate of feed constant. The rate can be set at any level desired by the operator, but once this level is chosen, it should remain there. For smaller towers it is the usual practice to adjust the feed by a hand-operated valve, and to measure the flow with a rotameter. Although such an arrangement requires a constant head on the upstream side of the valve, flows up



Key to the symbols used in Figs. 2 to 18 inclusive

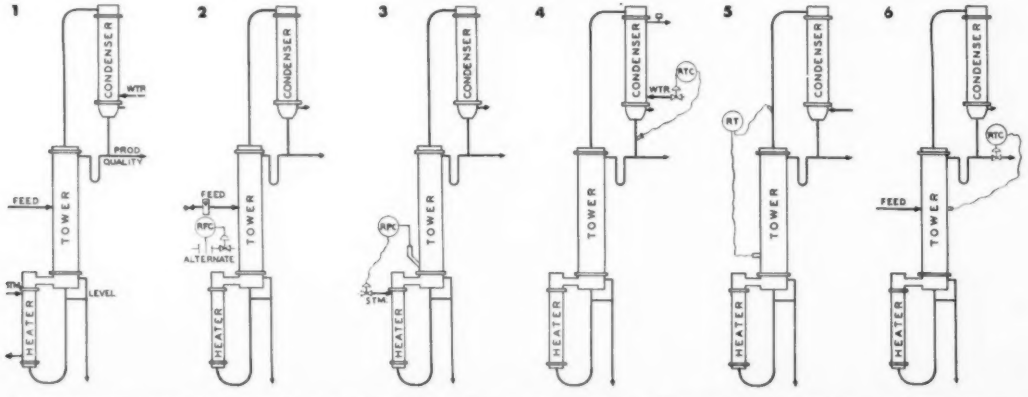


Fig. 1—Elements susceptible to control. 2. Feed control. 3. Steam control by base pressure. 4. Water control by condensate temperature. 5. Recorded temperatures. 6. Product control by temperature

*Group supervisor, engineering research laboratory, E. I. du Pont de Nemours & Co., Inc., Wilmington. Portion of paper presented at I.I.R.D.-I.S.A. conference, St. Louis.

to 200 g.p.m. can be handled satisfactorily. Above this level, flow controllers are generally employed. (Fig. 2.)

Consider next the control of heat input, or the boilup. The most sensitive index of tower operation is the pressure drop through the tower itself, since this drop is normally a true indication of the rate of boilup. It so happens that entrainment and pressure drop are both functions of the volume and density of the vapor rising upward through the column, and for any entrainment level, no matter what the composition of the vapor, there is an approximate corresponding pressure drop. At a 15 per cent (15 lb. liquid entrained per 100 lb. vapor) ratio, with a liquid seal of about 1 in., this drop is roughly 1½-1¾ in. of water per plate. It is possible to determine the boilup by measuring the condensate rate from the reflux and product rotameter readings, but one cannot be sure the tower is behaving correctly unless the pressure drop is at the proper level.

The way to insure that the tower works as a fractionating device is to maintain the proper boilup by regulating the steam to maintain the corresponding pressure drop over the column. It is a common practice to control the steam to the heater by the pressure of the vapor below the bottom plate of the tower (Fig. 3). This is equivalent to control of the pressure drop across the tower, when the pressure at the condenser vent is atmospheric. The particular advantage of this method of boilup control is that the tower can be run continuously at its maximum capacity. As the boilup is raised the pressure drop over the tower increases, and if carried to extremes, the tower can be loaded. It is possible, however, to control the pressure just below the loading point and operate satisfactorily, in spite of variations in feed and reflux ratio.

The boilup through the tower, of course, is dependent upon the steam consumption of the heater. While the control just described is usually preferred, it is often possible to do a satisfactory job with an ordinary flow controller on the steam line. While this will not insure that the tower operates as a fractionating device in the event of foaming or plugging, in most cases it is adequate. Pressure drop across the tower should be measured even if not employed for control.

Having provided for proper regulation of the steam and boilup, it then becomes necessary to condense the vapors issuing from the top of the tower to the condenser. The control system utilized depends upon the condensing system employed, but control from the condensate temperature is usually adequate (Fig. 4).

Sometimes control is attempted from the temperature of the outlet water. This should be avoided, however, if the water side of the condenser is liable to become dirty. The outlet water temperature then falls and the condensate temperature rises, and to make things worse, the water rate is cut down by the controller. The important point is to condense the vapors which go to the condenser, and a controller on the water is not essential to satisfactory operation of the tower under atmospheric pressure.

The next consideration is maintenance of reflux ratio so as to obtain uniform product quality. It is possible to use the temperature differential over the tower for maintenance of product quality. There are usually three temperatures recorded, one of which is employed to regulate automatically the withdrawal of overhead product, and so control the reflux ratio:

1. **Temperature** in the top vapor line is usually recorded to check that no bad product has been made (Fig. 5), but it should not be used to control the product takeoff, since unless the tower is misoperated, it should always record a constant value of the boiling temperature of the overhead product. The control temperature must be permitted to vary a degree or so, and if this top temperature varies, the quality of product usually is adversely affected.

2. **Proper location** of the product-withdrawal control temperature can be chosen only from a knowledge of the temperature gradient over the tower, which can be approximated from data developed during design of the tower, since it depends on the reflux ratio employed.

The bulb actuating the product takeoff controller is usually located at some spot where there is a reasonable temperature differential per plate, on the order of 3° to 5° C. The usual location of the bulb is close to and above the feed (Fig. 6). If the correct temperature is maintained on this plate, and the tower is operating at the proper boilup, the correct concentration gradient is then established throughout the tower. The control temperature will vary a little, but this is not a serious matter. As it varies, the concentration gradient may alter by a fraction of a plate, but since there is usually a little safety factor in the number of plates, the resulting change at the ends of the tower is of no consequence.

3. **Temperature** three or four plates from the bottom of the tower is usually recorded as well (Fig. 5), and it should read the boiling temperature of the high-boiling component. The reason for this is that in the event low-boiler finds its way down the tower, its presence can be recognized by a lowering of the temperature and corrective measures taken before it flows out the bottom of the tower.

It is the usual practice to install rotameters in the reflux and the product lines as well as in the feed line, so that at a glance one can tell the total boilup as well as the reflux ratio (Fig. 7).

Level control is of some importance,

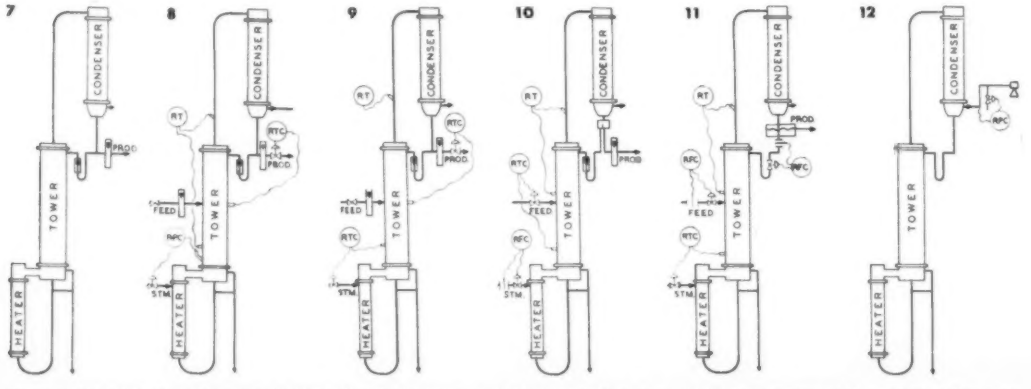


Fig. 7—Rotameters on condensate. 8. Typical control system. 9. Typical control system. 10. Control system with constant reflux ratio. 11. Control system with constant reflux rate. 12. Control of pressure-vacuum operation

particularly in pressure or vacuum units, but since the operation of level controllers is quite simple, and they have practically no bearing whatever on the internal workings of the tower, they need not be discussed here, nor are they illustrated in any of the figures.

The system just described, which is illustrated in Fig. 8, finds wide usage, and is in general quite satisfactory. Its advantages are that the tower may be operated at its maximum capacity, and also with a high degree of flexibility. There are, of course, a fixed number of actual plates in a tower under control. The efficiency of these plates is a function of the vapor rate.

The variable reflux ratio makes for flexibility, since the fractionating capacity is, to a large degree, independent of boilup rate. With such a system it is possible to cope with reasonable variations in feed rate and composition. With this system it is not necessary to worry about the absolute value of the reflux. If the proper boilup rate is maintained inside the tower and the proper location and temperature of the control bulb have been chosen, the reflux ratio will take care of itself and good-quality product will be obtained, provided of course the tower is not fed with more than it can handle.

The disadvantage of this system is that it is possible to waste steam. If the feed rate is reduced to a low level and a high base pressure (or boilup) is maintained, then the reflux ratio will be higher than necessary. The quality of the product will, of course, be satisfactory, but some steam may be wasted. It is, however, a simple matter to change the boilup when feed rate is changed and this is generally just what is done, but the waste of steam occurs when the operator forgets to do it.

There are other systems often used that also operate with satisfaction. For example, the same control system described above may be used with the exception that the flow of steam to the heater is controlled by a temperature near the base of the tower (Fig. 9) rather than base pressure or flow control. This necessitates proper choice of the control temperature so that the two temperature controllers will not antagonize each other and cycle.

The advantage of this arrangement is that it runs the tower with the minimum consumption of steam, although with this system of control it is not safe to attempt to operate at the maximum capacity of the tower, and one must be prepared to sacrifice a little on tower capacity. The reason is that a temperature controller has no idea as to how near to loading the tower may be, since loading is a function of boilup rate and pressure drop across the tower, and not temperature. This system does not insure that the tower always operates as a fractionating device. Once the tower has loaded, the control system usually aggravates the condition, and it is a difficult job to get it back into operation. This system of control, however, is frequently employed and often gives satisfaction.

Another system sometimes used is illustrated in Fig. 10. Here the rate of steam flow to the heater is set by a flow controller, and some device is used to split the flow of condensate so the reflux ratio is held constant at any predetermined value. The flow of feed to the tower is controlled by a temperature near the base of the tower and if it be desired to make the tower run faster, the rate of steam flow to the heater is increased. This raises the controlled temperature near the base and additional feed is then automatically introduced until the controlled temperature returns to the proper level.

It would seem that this system, or for that matter any system operating with a fixed reflux ratio, lacks flexibility. As the boilup increases, entrainment increases and plate efficiency falls off. It is impossible to compensate for this reduction in effective plates by increased reflux, as the ratio is fixed. The fractionating capacity is no longer independent on the boilup rate, unless the reflux ratio is changed manually, and this is equivalent to manual control of the reflux ratio.

Another control system frequently employed is shown in Fig. 11. Steam flow is controlled by a temperature near the base of the tower, while feed and reflux rates are set by flow control. Variations in boilup rate then result in variations in product rate.

All these systems described above are supposed to yield fairly pure products out both ends of the tower and all utilize some sort of temperature control, which means there must be a considerable differential over the tower. In the event it becomes necessary to separate two materials which boil quite close together, the temperature differential may be inadequate for control. When this occurs, it is frequently the practice to utilize flow controls on feed and steam, and to use a constant reflux ratio. The reflux ratio and the point of feed entrance are fixed so that under the most disadvantageous conditions of feed rate and concentration there will always be sufficient reflux and enough plates to give one product of the desired purity, and variations in the feed will result in variations in the purity of the other, less important product. It is obvious that this system is quite inflexible.

Where it is impossible to employ temperature for control of product quality, other continuous methods of measuring plate composition such as viscosity, refractive index, or specific-gravity determinations are sometimes used. Spectrographic analysis offers another method. An ingenious scheme of utilizing the vapor pressure differences between the liquid boiling inside a tower and a known sample contained in a capsule placed in the boiling liquid has been patented by S. C. Carney[1] and recently described by V. V. Tivy[2]. The pressure differential is reported to

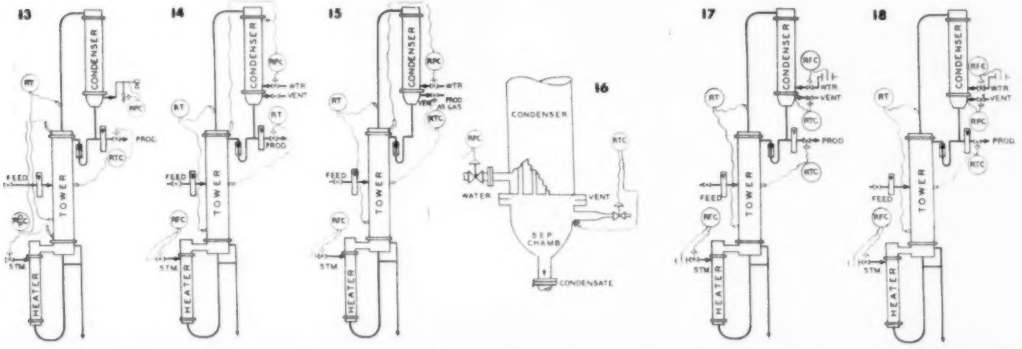


Fig. 13—Typical control system—vacuum operation. 14. Typical control system—pressure operation, no inert gas. 15. Typical control system—pressure operation, product removed as gas. 16. Thermo-gas release. 17. Typical control system—pressure operation. 18. Typical control system—pressure operation

Farm Bureau to Install Fluid Cat Cracking Unit

By R. J. Potts

Superintendent, Refinery Division, Indiana Farm Bureau Cooperative Association, Inc.

THE installation of a UOP Improved Fluid Catalytic Cracking Unit which is planned for our refinery at Mount Vernon, Ind., is a major step in a continuing program pointed toward increased capacity and improved operating efficiency.

R. J. Potts

We believe that our new cat cracker, together with other improvements which we have contemplated, will place us in a better position than ever before to perform our function, which is to supply adequately the continuously growing number of our customers with high quality gasoline and other petroleum products.

Plan for the Future

Our plans do not stop with producing gasoline to meet today's—or tomorrow's—standards. We are looking far into the future. The trend of automotive engine design today points to steadily increasing compression ratios which will require motor fuel of higher octane rating than the premium gasoline of today and the improvements now planned will enable us to keep step with the advancing "march of the octanes" for years to come. It is expected that with the aid of the new facilities, of which the cat cracker will be the key, the refinery will produce about 71% of gasoline, based on crude. With three cc of tetraethyl lead, approximately 40% of this gasoline will have 94 octane rating, and the remainder 86 octane (Motor Method).

When the new operation is in effect, running our present daily capacity of 8,000 barrels of Illinois Basin crude, yields of products are expected to be as follows:

	Barrels
Gasoline (including poly)	5,660
Kerosene	400
No. 6 Fuel Oil	1,540
Butane	120

In addition, the production of fuel gas will be sufficient to develop 116,000,000 Btu per hour, enough to supply the fuel needs of the plant.

Cat Cracker Has Single Column

The cat cracker will have the reactor and regenerator housed in a single column. Its design capacity will be 3,640 b/d at 55% conversion which is more than one and one-half times the original crude capacity of our refinery. A saving will be effected through omitting the flue gas waste heat boiler which is usually a part of the UOP design.

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The boiler is unnecessary at present because of the large quantity of gas available for fuel.

The cat cracker and other new facilities will be designed and engineered by Universal and built by our own refinery forces.

Other Equipment

The current project includes, in addition to the cat cracker, a new vacuum unit and a gas concentration system. Design capacity of the former will be 3,200 b/d of reduced crude. Its function is to produce vacuum gas oil as charge to the cat cracker.

The gas concentration unit is a three-column system designed to recover approximately 75% of the propane and over 95% of the butane from the gas. It will include a reboiler stripper for removing the H_2S from the gas to be charged to the UOP catalytic polymerization unit, which is a part of our existing plant. This unit is producing 120 b/d of 82 octane polymer and will be enlarged to handle the increased volume of cracked gas and to produce about 300 barrels of polymer daily.

When market conditions warrant, bottled gas, or LPG, can be produced with only minor changes.

The UOP 2-coil thermal cracking unit, which also is a part of our existing plant, will be operated to the best advantage as an adjunct to the cat cracker. The capacity of the thermal cracker was recently enlarged for this purpose by the addition of a second reaction chamber. This added about 300 b/d to its capacity.

The catalytic cycle stock, together with vacuum bottoms and miscellaneous virgin stocks, totalling about 2,760 b/d, will be processed in the thermal cracker, which is flexible enough to permit the cracking of kerosene.

While some existing elements will be used, most of the equipment will be new, purchased by the Franklin Supply Company, Chicago.

Built in 1940

The 10-year history of our refinery has been a record of consistent progress. It was built from the ground up, in 1940, by our Association, to process crude from the nearby Griffith pool and supply Farm Bureau members in Indiana with gasoline and other petroleum products. The original plant consisted of a 2,000 b/d skimming unit.

As motor fuel consumption and octane requirements steadily increased, it became necessary for us to produce more and better gasoline. To this end we started construction of the thermal cracking unit above referred to which went into operation in June, 1946.

The next step was the installation of the modern 8,000-barrel crude unit placed in operation in September, 1948.

Today the plant is running four times as much crude as its original capacity and producing gasoline and other products of a quality impossible to achieve when the original refinery was built.

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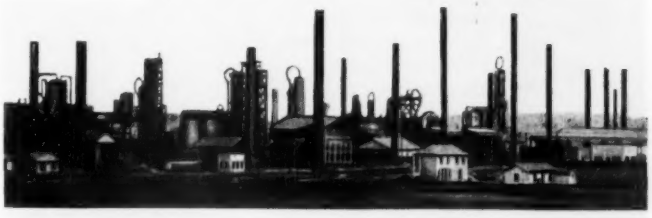

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operate the controlled product take-off valve.

Vacuum Towers

Systems described above have been chiefly for operation at atmospheric pressure. When it is desired to operate under vacuum, it is necessary to connect the condenser vent to a jet or pump to maintain a reduced pressure on the system. If it is necessary to control the absolute pressure, this is usually done by bleeding outside air through a controlled valve into the exhaust line to the jet or pump (Fig. 12).

The systems used for controlling the vacuum tower, however, are almost identical with those used at atmospheric pressure (Fig. 13), with the exception that steam flow to the heater is now controlled by pressure differential across the tower, rather than by pressure at the base of the tower. An ordinary flow controller is also adequate for steam regulation.

Pressure Towers

Control of a tower operating under pressure is a more difficult problem and requires a more intricate type of control system. If no inert gases, or low-boiling constituents which cannot be condensed, are introduced or generated within the tower, the problem is encountered in its simplest form. The steam rate (Fig. 14) is controlled by a flow controller or by pressure differential across the tower to maintain the desired boilup. The reflux ratio is regulated in the usual manner, by column temperature or through a constant reflux device.

Pressure within the condenser system is developed by the vapor pressure of the condensate alone and is controlled simply by the flow of condenser water. If the pressure is too high, water is turned on, and vice versa. Condensation occurs without appreciable subcooling and the vent valve remains closed, since there are no inerts which must be released.

If, however, inerts or very low-boiling constituents are present, the problem becomes somewhat more complicated. The pressure within the condenser system now results from the combined partial pressures of the condensate and the inerts. These inerts are believed to collect first around the condensate outlet and vent. As their volume increases they reduce condenser efficiency by a blanketing action. When present, however, they can be used to alter the effective condensing surface to assist in controlling the pressure on the system. The main problem is then to get rid of them continuously at just the proper rate.

Suppose the pressure on the system is controlled by the water rate to the condenser as shown in Fig. 14. When inert gases start to build up within the condenser, part of the surface becomes blanketed and the condensing efficiency is reduced. The pressure tends to rise and the water valve opens in an attempt to return the pressure to the controlled level. Unless the inerts are vented, they may eventually build up to the point where enough of the condenser is blanketed so that it becomes impossible to keep the pressure at the desired level, even with the water valve wide open. It becomes necessary to release the inerts continuously, and it is wise to accomplish this before the water valve is wide open.

Removal of these inerts is a relatively simple matter if it is possible to withdraw overhead product as a gas. The overhead is withdrawn from the vent valve (Fig. 15) and the inerts pass from the system along with the product. The vent valve then becomes the product-takeoff valve and can be controlled by a temperature in the tower. This system works best when the overhead product comprises a small proportion of the feed. In order to operate in this fashion, it is usually neccessary to waste the overhead product, so it is only on rare occasions that this system can be used.

The removal of inerts is even more complicated, however, when it is necessary to withdraw overhead product as liquid rather than vapor. A device known as a thermogas release is often employed. This is a thermometer bulb located in the gas-liquid gathering portion of the vertical condenser (Fig. 16). As inerts

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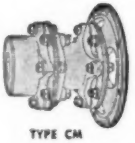

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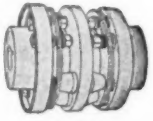

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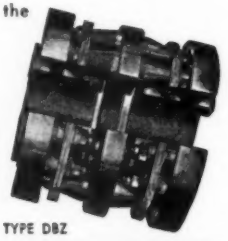

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build up, with the flow of steam or boilup fixed, the pressure tends to rise, and more water then flows to the condenser to try to reduce the pressure. This results in cooling of the bottom section of the condenser where the inerts first collect, and as the inerts are cooled, the temperature measured by the thermometer bulb falls, causing the automatic vent valve to open and release inerts. This provides additional effective condenser surface, and the increased rate of condensation brings the pressure down to the controlled level (Fig. 17).

The system just described utilizes a variable water rate to the condenser in order to control the pressure of the system. Another control system, utilizing a fixed rate of water flow, is shown in Fig. 18. The steam flow is regulated by flow controller or by pressure differential, and the water to the condenser is regulated by a flow controller. Reflux ratio is regulated by a temperature within the column, or by flow control on the reflux. As the inerts collect in the condenser the pressure builds up, and the vent valve is controlled by the pressure in the vent system. As this pressure rises, the vent valve opens to release inerts and to reduce the pressure to the desired level.

An attempt has been made to outline briefly herein the behavior of the tower as a fractionating device, and elements which should be considered when selecting a system of control. Numerous systems in common use have been described and their advantages and limitations discussed. It is hoped that this material will prove of use to those concerned with the problem of controlling distillation towers in an efficient and economical manner.

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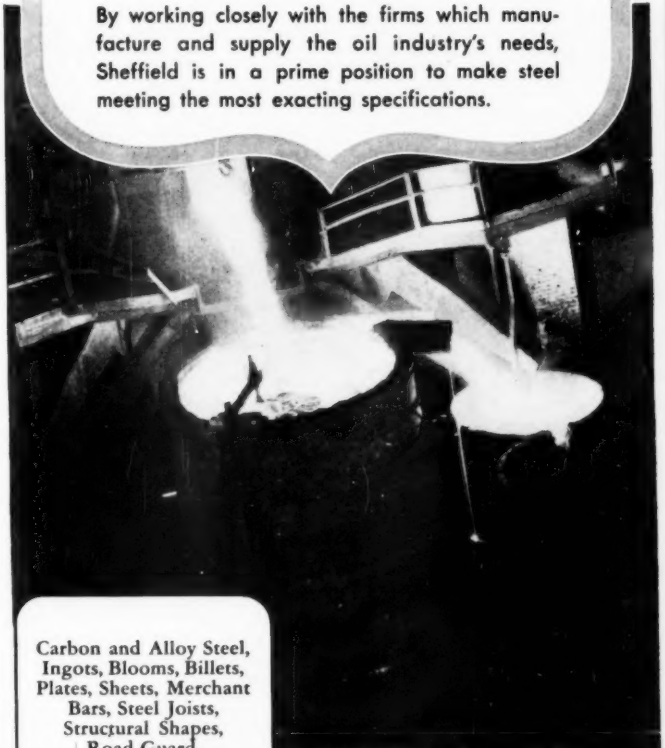

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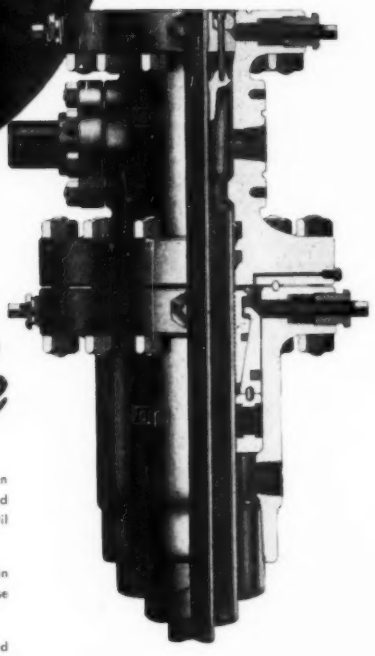

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Selecting THE DRILL STEM

by Stanley Moore* and Bruno Scharbarum†

MORE emphasis than ever before is being placed by contractors on economical operation. This is indicated by the greater care being taken in matching the capacity of drilling rigs to work to be done as it has been recognized that overloading equipment results in slower rates of penetration and in excessively high maintenance costs. It is the purpose of this paper to point out the field in which further study and work can be done so as to decrease the loads on present drilling equipment or increase its depth capacity.

It appears that a basic relationship exists among the horsepower available on the rig, drill-stem size, and the depth and diameter of hole to be drilled. Such other factors as mud characteristics, bit designs, stand lengths, etc., while important, are not considered as basic.

The principal purposes of the surface equipment are to hoist the drill stem out of the hole whenever it is necessary to replace the bit, and to maintain a proper rate of circulation of the drilling fluid through the drill stem, bit, and annulus. The first problem is strictly a mechanical one, while the second is one in hydraulics. The mechanical function of rotating the pipe is not considered for the reason that power requirements are generally small and little can be done to reduce this requirement by changing drill-stem size.

Hoisting Requirements

In West Texas the rig horsepower requirements set forth by operating companies for 10,000-ft. drilling is not less than 1,000 hp. It is predicated on using 4½-in. drill pipe and boring 8¾-in. hole to 10,000 ft. This gives a figure of 1 hp. for each 10 ft. of depth.

This factor seems to work out quite well even for more shallow wells. For example, in Scurry County, North Snyder pool which is approximately 6,750 ft. deep would call for rigs with a rating of 675 hp. It so happens that most of the rigs in this area are of this size. With 4½-in. drill stem and 60,000 lb. of drill collars, the average trip of 6,500 ft. with a rig of 675 hp. takes approximately 3.8 hours.

With the same rig and 3½-in. pipe and 40,000 lb. of drill collars, the time on an average trip is 2.9 hours which results in a saving of nearly 1 hour per trip. Another factor to consider is that the small bits generally used with 3½-in. pipe do not last as long under comparable load conditions as the larger 8¾-in. bits.

Under the above conditions in Scurry County, the 12¼-8¾-in. hole pattern requires an average of 41 bits, while the 11-6¾-in. requires 51 bits. From this it can be seen that there is a saving of 7.9 hours in hoisting time per well when the slim-hole pattern is used. This is slightly more than 1 per cent of the time on the well.

Another illustration we might use is that of 10,000-11,000-ft. work. In Ector County, West Texas area, we have drilled wells in which we have followed the 13⅜-9⅝ and 7-in. casing pattern, while other offset wells have been drilled with the 10¾-7⅝ and 5½-in. casing pattern. The same rig and same crews were used. The rig was one having a rating of 1,000 hp. behind the draw works.

LARGE HOLE PATTERN

Well	Trips	Trip hours	Hours trip
A	144	597½	
B	121	491¼	
C	139	533¼	
Average	135	541	4.01

SLIM-HOLE PATTERN

Well	Trips	Trip hours	Hours trip
D	166	671¾	
E	173	650¾	
Average	169	661¼	3.92

It is noteworthy that the average trip with small pipe only took 6 minutes less than with the larger 4½-in. drill pipe.

The above illustrations show that there is not much saving in time in hoisting when using little pipe over the larger drill stem, provided, of course, the rig has adequate power to do the job in the first place. It also clearly shows that a change in drill-stem specification will not materially affect the power required for the efficient hoisting of the drill stem.

In view of the above, and the fact that at least 65 per cent of the power generated on the rig is finally used to impart energy to the drilling fluid, it would seem advisable to look into the hydraulics of the drill stem and well bore as a possible means of reducing the load on the rig.

The Hydraulic Factor

Insufficient attention has been given to hydraulic efficiency in making drill-stem selections. As wells become deeper, this factor becomes increasingly important, because a greater percentage of the available pumping capacity is expended overcoming losses down the drill-stem bore and up the well-bore annulus. In fact, the benefits to be gained even in moderately deep holes are far greater than commonly realized.

We find that thinking is even now influenced by Oklahoma City and Seminole experiences, where 6⅝-in. drill pipe was used to make 11-in. holes to about 3,800 ft. Losses attributable to the drill stem amounted to only about 75 psi., or 15 per cent of the total, whereas the loss through the single water course in the Simplex bit may have been four or five times this amount. Therefore, at that time the most important hydraulics factor was the nozzle in the bit.

Today, losses attributable to the drill stem, including drill collars, usually amount to 80 to 90 per cent of the total pump pressure. In a sense the majority of this loss is wasted energy and it appears that efforts should be made to increase efficiency here. All indications are that these losses can be cut in half on the average operation, and the total energy required to operate a rotary rig reduced by 30 to 40 per cent.

If the comparatively new technique known as "jet drilling" is to be effectively utilized, attention must be given to the hydraulic efficiency of the circulating system. This method calls for the expending of considerable energy at the bit nozzles to obtain high jetting velocities. If large quantities of energy are uselessly wasted circulating through a poorly designed circulating system, it becomes a problem indeed to provide enough

*Drill Collar Service Co., Midland, Tex.
†Carl B. King Drilling Co., Midland, Tex.

power to produce the high-velocity jets desired at the bit.

No doubt the slowness of improvement in the hydraulics of drill stem is largely due to a general lack of attention to the importance of relatively small differences in the internal diameters of tubular members which conduct the flow. One example which demonstrates the importance of design for hydraulic efficiency follows:

In selecting drill collars, how much thought is given to the difference between 2 and 2¼-in. bore? It is only ¼ in., but if you are a West Texas operator, running 20 drill collars and circulating 250 g.p.m., it means 15 to 25 per cent difference in the efficiency of your entire pumping operation. Think of the significance of this in terms of equipment, maintenance, and fuel costs.

To approximate the importance of internal diameters, consider the fact that it takes approximately 32 times as much power to circulate through a 1-in. i.d. pipe as through a 2-in. i.d. pipe. In terms of drill stem this means:

1. Twice as much power is required to circulate through a 2-in. bore drill collar as through a 2¼-in. bore drill collar.

2. Twelve times as much power is required to circulate through a 2-in. bore drill collar as through a 3-in. bore drill collar.

3. Two and one-half times as much power is required to circulate through 3½-in. o.d. drill pipe as through 4-in. o.d. drill pipe.

4. Five times as much power is required to circulate through 3½-in. o.d. drill pipe as through 4½-in. o.d. drill pipe.

5. Eight times as much power is required to circulate through 3½-in. o.d. drill pipe as through 5-in. o.d. drill pipe.

Generally larger-diameter drill stem than that in use today is desirable for improvement of hydraulic efficiency. Aside from the hoisting problem, which has already been discussed, there are several other operational factors to be considered when recommending larger-size drill pipe.

Drill-Pipe Operational Factors

Elevator shoulders.—On the average, the tool joints in use today are 1¼ to 1½-in. larger in diameter than the drill pipe. With present methods of attaching tool joints to drill pipe, this great difference in diameter is not needed for strength in the connection between tool joint and drill pipe. The only apparent reasons remaining for having the tool joints so much larger than the drill pipe are to provide an elevator shoulder and to make allowance for abrasive wear on the outside diameter. This large elevator shoulder constitutes a real obstruction to hydraulic efficiency, especially in the smaller-size holes.

In view of the fact that the most efficient drill stem has tool joints

TABLE 1—APPROXIMATE PRESSURE LOSSES IN 6¾-IN. HOLE AT 6,500 FT.—CIRCULATING 200 G.P.M.

Description of drill stem	Part of system	Loss psi.	Fluid hp
3½-in. internal flush—5-in. o.d. tool joints—twenty 5½-in. o.d. by 2-in. i.d. by 30-ft. drill collars	Drill-pipe bore and annulus	540	61
	Drill-collar bore and annulus	360	42
	Bit, with three 8/8-in. jets	60	7
	Surface connections	20	2
	Total pump pressure	980	112
4-in. full hole—5¼-in. o.d. tool joints twenty 5½-in. o.d. by 2¼-in.i.d. by 30-ft. drill collars	Drill-pipe bore and annulus	360	42
	Drill-collar bore and annulus	230	27
	Bit, with three 8/8-in. jets	60	7
	Surface connections	20	2
	Total pump pressure	670	77
4½-in. slim hole—5-in. o.d. tool joints—twenty 5½-in. o.d. by 2½-in. i.d. by 30-ft. drill collars	Drill-pipe bore and annulus	290	34
	Drill-collar bore and annulus	135	16
	Bit, with three 8/8-in. jets	60	7
	Surface connections	29	2
	Total pump pressure	505	59

TABLE 2—APPROXIMATE PRESSURE LOSSES IN 8¾-IN. HOLE AT 6,500 FT.—CIRCULATING 350 G.P.M

Description of drill stem	Part of system	Loss psi.	Fluid hp
4½-in. full hole—5¾-in. o.d. tool joints—twenty 6-in. o.d. by 2¼-in. i.d. by 30-ft. drill collars	Drill-pipe bore and annulus	380	78
	Drill collars and annulus	430	87
	Bit, with three 11/16-in. jets	140	28
	Surface connections	65	13
	Total pump pressure	1,015	206
5-in. extra hole—6¼-in. o.d. tool joints—twenty 6¼-in. o.d. by 2¾-in. i.d. by 30-ft. drill collars	Drill-pipe bore and annulus	200	41
	Drill-collar bore and annulus	165	33
	Bit, with three 11/64-in. jets	140	28
	Surface connections	65	13
	Total pump pressure	570	115

TABLE 3—APPROXIMATE LOSSES IN 6¾-IN. HOLE AT 10,000 FT.—CIRCULATING 250 G.P.M.

Description of drill stem	Part of system	Loss psi.	Fluid hp
3½-in. internal flush—5-in. o.d. tool joints—twenty 5½-in. o.d. by 2-in i.d. by 30-ft. drill collars	Drill-pipe bore and annulus	1,300	190
	Drill-collar bore and annulus	480	70
	Bits, three 8/8-in. jets	90	13
	Surface connections	30	4
	Total pump pressure	1,900	277
4-in. full hole—5¼-in. o.d. tool joints—twenty 5½-in. o.d. by 2¼-in. i.d. by 30-ft. drill collars	Drill-pipe bore and annulus	900	131
	Drill-collar bore and annulus	280	41
	Bit, with three 8/8-in. jets	90	13
	Surface connections	30	4
	Total pump pressure	1,300	189
4½-in. slim hole—5-in. o.d. tool joints—twenty 5½-in. o.d. by 2½-in. i.d. drill collars	Drill-pipe bore and annulus	700	102
	Drill-collar bore and annulus	210	31
	Bit, with three 8/8-in. jets	90	13
	Surface connections	30	4
	Total pump pressure	1,030	150

TABLE 4—APPROXIMATE PRESSURE LOSSES IN 8¾-IN. HOLE AT 10,000 FT. CIRCULATING 450 G.P.M.

Description of drill stem	Part of system	Loss psi.	Fluid hp
4½-in. full hole—5¾-in. o.d. tool joints—twenty—6-in. o.d. by 2¼-in. i.d. by 30-ft. drill collars	Drill-pipe bore and annulus	1,040	271
	Drill-collar bore and annulus	640	168
	Bit, with three 11/16-in. jets	220	58
	Surface connections	95	25
	Total pump pressure	1,995	522
5-in. extra hole—6¼-in. o.d. tool joints—twenty- 6¼-in. o.d. by 2¾-in. i.d. drill collars	Drill-pipe bore and annulus	600	158
	Drill-collar bore and annulus	250	66
	Bit, with three 11/16-in. jets	220	58
	Surface connections	95	25
	Total pump pressure	1,165	307
5½-in. double streamline—6¼-in. o.d. tool joints—twenty—6¼-in. o.d. by 3-in. i.d. drill collars	Drill-pipe bore and annulus	470	123
	Drill-collar bore and annulus	185	48
	Bits, with three 11/16-in. jets	220	58
	Surface connections	95	25
	Total pump pressure	970	254

which are only about ¾-in. larger in diameter than the drill pipe, it would seem advisable to make some arrangement which would permit lifting it without the use of elevator plugs. In fact, we see no reason why such tool joints should not be made with the 18° taper elevator shoulder, reinforced with tungsten carbide hard facing, and used in the conventional manner.

Fishing space.—The use of small drill stem to permit abundant space for fishing usually results in poor hydraulic efficiency. Developments in fishing tools and fishing methods have reduced the space required. Consideration of the benefits to be attained from a hydraulics standpoint should be enough to cause us to take advantage of these developments. Metallurgical and design improvements have made possible the building of strong fishing tools which require very little space. Overshots, for example, can be obtained which will catch 5½-in. o.d. tool joints in 6¾-in. hole—and 7-in. o.d. tool joints in 8¾-in. hole.

If wide elevator shoulders are not required, then fishing space will be no problem. For example, 4½-in.o.d. drill pipe is the most efficient size for use in 6¾-in. hole. The most efficient tool joints would be the 4½-in. slim hole or double streamline types, which have an outside diameter of only 5 in. and these would not be an obstruction to fishing. If a regular elevator shoulder is used, then the pipe would have to be smaller or the tool joint larger. Smaller pipe would restrict the flow. Larger tool joints would not only reduce the fishing space, but would also reduce hydraulic efficiency by restricting the flow in the annulus.

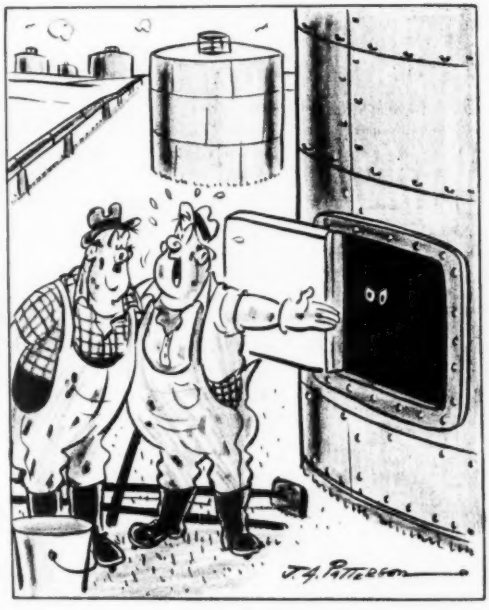
Effect on bottom-hole pressure.—A little known or considered factor in the selection of drill stem is its effect on bottom-hole pressures. When circulation is started, the bottom-hole pressure increases by the amount of pressure required to force the drilling fluid up the annulus between the drill stem and well bore. When the drill stem is withdrawn from the hole, the bottom-hole pressure decreases because the drill stem itself acts as a swab. In either case, the effects are greater if drill pipe, tool joints, or drill collars are made larger in outside diameter.

Let us consider the bottom-hole pressure increase in an 8¾-in. hole at 10,000 ft., circulating 450 g.p.m. Remembering that many assumptions must be made to arrive at any figures at all, we calculate the increase, when using 4½-in. full-hole drill stem and twenty 6¼-in. o.d. drill collars, at 149 psi. If the drill-stem size is increased to 5-in. extra hole, the pressure increase during circulation would be approximately 190 psi. If the drill-stem size were further increased to 5½-in. double streamline, the pressure increase during circulation would be approximately 230 psi.

No doubt some will be interested in the effect of drill collars having an o.d. only slightly smaller than the bit size. Let us consider 8-in. o.d. drill collars in 8¾-in. hole, using 450 g.p.m. The pressure increase on bottom for each drill collar added would be somewhere near 45 psi. If the circulation rate were 350 g.p.m., the increase per drill collar would be approximately 27 psi. If 7-in. o.d. drill collars were used in the 8¾-in. hole, the increase would be about 4 psi. per collar added for 450 g.p.m. and about 3 psi. per collar added for 350 g.p.m.

Utilization of larger bore drill collars.—Many of the objections usually raised to the use of larger drill stems have already been discussed. In the case of larger-bore drill collars, two objections are usually raised. It is pointed out that larger bore weakens the pin and reduces the weight of the collar.

With regard to the strength of the pin member on larger-bore drill collars, it is true that the pin will weaken if the bore is greater on the same size pin. However, if the desired bores and outside diameters are selected first, and the connection size



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then selected for maximum strength, the resulting drill collar will be as strong in resisting fatigue as one with smaller bore. Further, advancements in the design and metallurgical processing of drill-collar connections have increased their strength to such a point that the bore can be safely increased in many instances on a particular size connection without sacrifice.

The losses in weight, due to increasing the bore, are small compared to the benefits obtained. If the bore of a 30-ft. drill collar is increased from 2 to 2¼ in., the weight loss is 82 lb. If the bore of a 30-ft. drill collar is increased from 2¼ to 2¾ in., the weight loss is 200 lb. A study of the differences in pressure losses in drill collars shown in Tables 1 through 4 indicates that the larger-bore drill collars are best from an operational standpoint, even though it may be necessary to use one or two more drill collars to attain the weight desired.

Conclusions

1. If the depth rating of the rig is established by using a multiplying factor of 10 times the horsepower rating, then adequate power will be available to hoist any size drill stem with no appreciable difference in efficiency.

2. Considerable improvement over present drill-stem specifications are indicated by better selection of size, based on the hydraulic characteristics of the drill pipe, tool joints, and drill collars as related to well-bore sizes.

3. The improvements in hydraulic efficiency which can be attained are of such magnitude that rig operating costs can be materially reduced.

4. Available information on hydraulics is largely based on theory and potential benefits appear to be important enough to merit field study by association members, with the objective of establishing drill-stem standards to more nearly fit the hole patterns now being drilled.

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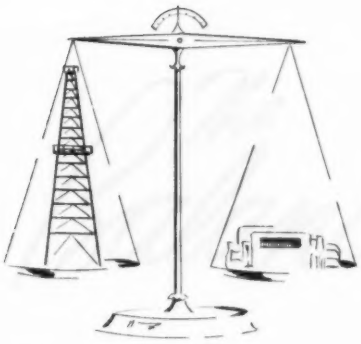

by C. H. Oberg

THE range of load variations necessary to accomplish all the functions of a rotary drilling rig such as drilling, hoisting, fishing, pumping, rotating, and a host of auxiliary operations presents a huge and complex problem to the designer and purchaser. The operator's ultimate aim in assembling any drilling rig is to be able to drill wells with maximum speed and lowest cost.

A drilling rig is called upon to perform two distinct main functions which consume 40 to 60 per cent of the total time expended on an average well. The first of these is drilling which involves two operations—rotating the drill pipe and circulating the drilling fluid. The second is hoisting and lowering pipe. These two functions are quite separate and the capacity of the rig for either is often underbalanced.

It is generally recognized that the proper rig for use in drilling soft formations is uneconomical for use in drilling hard-rock formations and vice versa. In the softer formations fewer trips are made and high pumping capacity is required. In the harder formations, a large number of round trips are made and lower circulation rates are required.

The first problem in obtaining a balanced rig then becomes a matter of establishing the power requirements involved in performing the above two functions. The second problem involves the use of this information in establishing the distribution of horsepower to suit a particular set of conditions. Because of the current general interest in mechanical rigs powered with internal-combustion engines, the following discussion will be centered on this type of equipment.

TABLE 1—APPROXIMATE HORSEPOWER REQUIREMENTS FOR THE CIRCULATION OF MUD

		2 ft. per second annular velocity			3 ft. per second annular velocity			4 ft. per second annular velocity		
Depth (ft.)	Hole dia.	4½-in. IF	5-in. IU	5½-in. FH	4½-in. IF	5-in. IU	5½-in. FH	4½-in. IF	5-in. IU	5½-in. FH
3,000	11	160	105	80	460	300	260	1,100	760	570
	9⅞	90	55	50	240	160	130	520	350	260
	8¾	40	30	25	90	65	60	210	135	170
	7⅞	20	20		40	30		70	50	
6,000	11	250	160	130	750	460	390	1,790	1,120	830
	9⅞	140	85	80	390	250	200	850	540	400
	8¾	70	50	45	150	110	100	350	210	230
	7⅞	35	35		75	55		120	85	
9,000	11	350	220	180	1,050	610	510	2,460	1,480	1,100
	9⅞	200	115	105	530	330	260	1,180	730	530
	8¾	95	70	60	210	150	140	480	290	290
	7⅞	55	50		105	85		170	120	
12,000	11	440	280	230	1,350	760	640	3,140	1,810	1,350
	9⅞	260	140	135	690	420	330	1,510	920	660
	8¾	120	90	80	270	190	180	620	370	330
	7⅞	70	70		135	110		220	155	
15,000	11	540	340	280	1,640	920	770	3,820	2,220	1,610
	9⅞	310	170	160	850	510	400	1,840	1,110	790
	8¾	150	110	100	330	230	220	760	440	410
	7⅞	85	85		165	135		270	190	
Gal. per min.	11	500	470	440	740	710	670	980	940	880
	9⅞	380	360	330	580	540	500	770	720	670
	8¾	270	250	220	410	380	350	550	500	450
	7⅞	160	140		240	210		320	280	

Note: (1) Approximate mud weight 10.0 lb. per gallon or 75 lb. per cu. ft. power required varies approximately in direct proportion to mud density. (2) In above computations, the bit was considered to have four ¾-in. holes. (3) Nominal weights of pipe shown: 4½-in., 16.6 lb.; 5-in., 19.5 lb; 5½-in., 21.9 lb.

The author is with Standard Oil Co. of California, Taft and San Francisco. Oberg graduated from Stanford University in 1932 and worked for Humble Oil & Refining Co. in 1933-1942. He was a lieutenant commander during the war. In January 1946, Oberg joined California Standard as a drilling engineer.

From paper presented at 1949 annual A.A.O.D.C. meeting, Dallas. Another portion of the paper will appear in the Journal at a later date, wherein several sketches and a discussion of suggested compounding arrangements for drilling to depths of 3,000, 6,000, 9,000, 12,000, and 15,000 ft. will be given.

Power Requirements for the Circulation of Mud

Value of high circulation rates.—The circulation of mud is the major job on a rotary rig, consuming 70 to 85 per cent of the horsepower-hours used in drilling an average well.[1] Past investigations have shown that in all but the hardest formations, the rate of penetration is proportional to the rate of circulation. Nolley, Cannon, and Ragland in a recent important paper on drag-bit research indicated that the rate of penetration of softer formation is directly proportional to the product of the rate of circulation and bit nozzle fluid velocity.[2] In a recent paper, Crake emphasized the value of high circulating rates and stated that rate of flow determines the following:[3]

1. The rate at which cuttings are lifted to the surface.

2. The volume of cuttings carried by each cubic foot of mud and, therefore, mud contamination.

3. The speed at which mud in the hole can be reconditioned, or the weight or other characteristics

TABLE 2—APPROXIMATE INPUT HORSEPOWER FOR HOISTING AT RATE OF 100 FT. PER MINUTE

Depth (ft.)	Engine to hook eff. (per cent)	Drill collar weight 20,000 lb. 4½-in. IF	5-in. IU	5½-in. FH	Drill collar weight 40,000 lb. 4½-in. IF	5-in. IU	5½-in FH	Drill collar weight 60,000 lb. 4½-in. IF	5-in. IU	5½-in. FH
3,000	70	310	340	370	380	410	440	440	470	520
6,000	70	550	620	700	620	680	770	680	750	840
9,000	65	860	970	1,100	930	1,040	1,180	1,000	1,110	1,260
12,000	65	1,120	1,270	1,450	1,190	1,340	1,530	1,260	1,410	1,610
15,000	65	1,380	1,570	1,800	1,450	1,640	1,880	1,520	1,710	1,950

Note: (1) Effect of buoyancy neglected as it is assumed to be equal to wall friction. (2) Nominal weights of pipe shown: 4½-in., 16.6 lb.; 5-in., 19.5 lb.; 5½-in., 21.9 lb.

TABLE 3—STRENGTH OF WIRE LINES

Size line (in.)	Breaking strength (lb.)	Hook working, lb. (S.F. 4) 6 lines	8 lines	10 lines	Derrick load, lb. (S.F. 2) 6 lines	8 lines	10 lines	12 lines
		Plow steel, 6 by 19 Seale construction, hemp center						
1	73,000	95,500	123,000	147,000	259,000	312,000	361,000	407,000
1⅛	91,000	119,000	152,000	184,000	323,000	383,000	450,000	508,000
1¼	112,000	141,000	183,000	226,000	398,000	478,000	555,000	625,000
1⅜	135,000	176,000	226,000	273,000	480,000	576,000	668,000	754,000
1½	160,000	210,000	268,000	324,000	569,000	683,000	793,000	893,000
		Improved plow steel, 6 by 19 Seale construction, hemp center						
1	84,000	110,000	140,000	169,000	297,000	358,000	414,000	471,000
1⅛	105,000	137,000	176,000	212,000	374,000	450,000	512,000	576,000
1¼	129,000	167,000	215,000	260,000	458,000	552,000	638,000	720,000
1⅜	155,000	202,000	260,000	314,000	551,000	663,000	766,000	861,000
1½	184,000	239,000	308,000	372,000	663,000	784,000	893,000	1,027,000

Note: Wire lines with independent wire-rope center have strengths 7½ per cent greater than values shown.

changed, to suit emergencies or other conditions.

4. The size of the cavings which can be removed and, thus, the hazard of sticking the pipe.

5. The amount of gas entrained in a cubic foot of return fluid and thus the blowout tendency of the fluid column.

6. The amount of bad mud contained in a well in case of a blowout hazard.

Thus the key to drilling efficiency lies first in the determination of the quantity of fluid in gallons per minute required to maintain proper velocity in the mud stream. This in turn will determine the friction losses and the power required for circulating mud.

Factors involved.—Although relatively high mean velocities in the returning mud stream and high nozzle fluid velocities are desirable, they are often limited in application by the friction head or pressure drop developed within the mud-circulating system. To keep this pressure drop at a minimum careful attention must be given to the relationship of hole diameter to drill-pipe size, using the largest size of drill pipe in the smallest hole diameter that will provide satisfactory clearance for fishing as well as clearance for running casing.

The annular velocities that are considered most satisfactory range from 2 to 4 ft. per second; the higher velocities being required where the formations are softer and the mud stream is required to carry more and larger cuttings. Greater annular velocities may cause the mud to have turbulent flow and require a much greater pressure head. High annular velocities also may impose greater pressure on the formation, causing loss of mud to the formation when circulating and expose the well to a blowout when circulation is stopped.

The fluid velocity in the drill pipe is usually within the region of turbulent flow of the mud and for this reason the range of velocity in the pipe should be no greater than 8 to 11 ft. per second to keep the pressure drop to a minimum. It is interesting to note that in the formula suggested by Beck, Nuss, and Dunn for pressure drop in the drill pipe with turbulent flow is proportional to the square of the mud velocity, proportional to the mud density and inversely proportional to the diameter of the pipe.[3]

A nozzle fluid velocity of 300 to 400 ft. per second has proved desirable when drilling soft formations with jet-type bits.[2] The practical limits on this important feature have not been well established but the resulting pressure drop is of such magnitude that it should not be overlooked when considering the design of a mud-circulating system. The energy requirements for such nozzle velocities could amount to several hundred horsepower.

The surface pipe, standpipe, hose, swivel, and kelly should be of a uniformly large inside diameter, short and free of unnecessary turns to avoid large pressure drops when circulating large volumes of fluid. These surface items cause a pressure drop of as much as 150 psi. and require the use of energy equal to 75 hp. An additional power loss is suffered in the pump and is normally considered to be 15 per cent.

Pump input horsepower.—The largest portion of the horsepower hours consumed in circulating mud is used in drilling the hole to be cased by the oil string. Therefore, the pumping plant on a balanced rig should be determined in most cases by the circulation required when drilling the proper size hole for this casing. Table 1 was prepared to indicate the horsepower requirements for attaining various annular velocities in the popular sizes of hole drilled for 5½ and 7-in. casing. With the exception of high nozzle fluid velocities, the factors indicated in the previous paragraphs and current articles on the flow of mud were considered in the preparation of this table.[2,4,5,6]

In hard formation drilling with high ratios of drill pipe to hole diameters and low annular velocities, the required pump horsepower is only a fraction of the power needed for hoisting and can be supplied by the drawworks engines. For the drilling of softer formations with low drill-pipe-to-hole-diameter ratios and high annular velocities for the removal of many and large cuttings, the necessary pump horsepower is equal to or greater than the hoisting horsepower.

Round trips are infrequent when drilling soft formations and it is imperative that large drill pipe such as 5 or 5½-in. o.d. be used in drilling the larger hole required in order to decrease the amount of installed horsepower and to lower maintenance and operating costs. The cost of circulating sufficient fluid when drilling harder formations is not so critical and the savings to be realized in using the larger drill pipe are offset by the added cost of wire lines and related hoisting equipment that are worn more rapidly when making frequent round trips with the heavier pipe.

Large-size holes are required for the usual 7-in. casing in soft formations and it is necessary to use large sizes of drill pipe to attain the needed high annular velocities. Smaller pipe can be used economically in harder and deeper formations where smaller holes are often drilled below protective strings of casing. Difficulties encountered in conditioning hot, heavy, and viscous muds used in deeper drilling usually require the addition of a pump for mud conditioning in addition to a standby pump. The drilling of large-diameter holes for surface casing or intermediate strings may be accomplished with satisfactory annular velocities by paralleling dual-pump installations.

Power Requirements for Rotary Table

The power required for rotating varies over a wide latitude because of the many sizes of hole drilled and because of the range in speeds. A rule-of-thumb formula for the conventional type of drive is to use 1 hp. for

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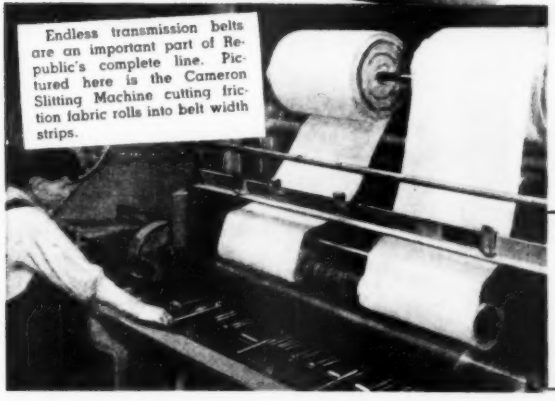

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Guiberson cups of the basket type, with flexible lips and strongly reinforced walls, have been proving their worth for many years in every type of swabbing and packing job. The "J" swab cup is a refinement of this principle, molded of the toughest oil-resistant compound known.

"THE 'J' CUP OUT-PERFORMS ANYTHING I EVER SAW!"

"The 'J' cups have proven to be the best we ever used," says one South Texas operator. "We lifted fluid containing over 10% sand in 2" tubing from 4000' depth and these new cups made 10 runs to one run made by the previous swab." An Oklahoma well servicing company says, "This 6500-foot well afforded us an excellent test. Lifting an average of 500' of fluid per trip in 2½" tubing this 'J' cup made five and six trips to one of another type."

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"K" Tubing Swab With "K" Cups | "K" Tubing Swab With "J" Cups | "K" Tubing Swab With "J" and "K" Cups

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each revolution per minute of the table.[7] Ample horsepower for rotating is provided by the No. 1 engine on most mechanical rigs and it becomes a relatively minor problem.

Power Requirements for the Hoisting of Pipe

An adequately powered draw works will start hoisting drill pipe off bottom at rated depth at around 100 ft. per minute. The rule-of-thumb method of calculating hoisting horsepower is to use 100 hp. for each 1,000 ft. of 4½-in. drill pipe at rated depth. A change in drill-pipe size or weight will change the depth rating or the horsepower required to a considerable extent.

Table 2 indicates the input horsepower required with various combinations of pipe sizes and drill-collar weights. Since only a small fraction of the total drilling time on a well is used in making trips, any great increase in the available hoisting power above that indicated would not be warranted because only the hoisting time, or 7½ to 12½ per cent of the total round-trip time, would be affected.[1]

A considerable power loss occurs between the engines and the hook. It is common to consider the loss in each line strung up as being equal to a 2 per cent power loss. The loss in the compounding transmission, the selective speed transmission, and the draw works is usually in the range of 18 to 20 per cent. The addition of torque converters between the engine and the hook will increase this power loss at full engine loads but will permit higher average hook horsepower.

Balancing the Equipment

Design of hoisting equipment.—Design of the hoisting system of a rotary rig is governed by the wire line to be used. The working strength of the line will determine the depth to which it can economically handle a given size of drill pipe. The diameter of the line and type of construction will determine the crown and traveling-block sheave diameters, the draw-works drum size, and the brake diameter. As insurance for a reasonably long wire-rope life, the working load on the line when handling drill pipe should be one-fourth of the breaking strength of the line. A 3 to 1 factor of safety may be used satisfactorily at the slow speeds used when running casing.

Table 3 indicates the capacities of various sizes of lines under various systems of reeving. Table 4 indicates the safe drilling depths for various combinations of wire lines and drill pipe sizes, based on a safety factor of four to one for the wire line.

Derrick Equipment

Derrick.—The strength of the wire line can also be utilized to determine the capacity of the derrick in which it is to be used. In this case a factor of safety of two for the wire line should be specified. This is the same factor of safety used in the design of the derrick. Table 3 indicates the derrick load for various sizes and strengths of wire line under different systems of reeving.

The height of the derrick should depend on the depth of the well and frequency of round trips. The size of the wire line used will also influence the height of the derrick. The width of the drum and the height of the derrick will then be influenced by the fleet angle the line coming off the drum makes with the center line of the fast sheave in the crown block. It is recommended that this angle be less than 1½°.

The time spent in making round trips is usually such a small portion of the total time spent on a well that the savings obtained by faster round-trip time in the taller derrick or mast should be carefully analyzed in order to justify the greater investment and added moving cost.

Derrick tackle.—The design of the crown block and traveling block should also be influenced by the size of the wire line to be used. The Wire Rope Institute recommends that the minimum diameter of the sheave be 30 times the wire-rope diameter for the usual 6 by 19 Seale type of construction. A factor of 45 times the rope diameter should be used when possible to improve the life of the rope.

The capacity of the hook, crown block, and traveling block may also be designed on the basis of the strength of the wire line used. As in the case of the derrick capacity, a factor of safety of two for the wire rope should be used. Current design practice for the hook and blocks requires the use of a factor of safety of four. In Table 5 are shown suitable capacities for this equipment balanced to the wire-rope capacity.

The life of the bearings in the crown and traveling blocks will be materially lessened if the rated speed and load on the bearings is surpassed. Care must be exercised to choose blocks with ample bearings for the tonnage and speed anticipated in order to obtain reasonable bearing life.

Draw Works

The design of the draw works should be determined by the wire-line size required to handle the drill pipe and drill collars at rated depth. The size of the line will directly limit the specifications of the drum and will indirectly govern the horsepower input to the draw works. The drum diameter should be approximately 25 times the rope diameter in order to obtain good wire-rope life.

The need for more than three or four speeds in the draw works of a standard mechanical rig is shown in Fig. 1.[18] The power curve is for a six-speed draw works driven by engines capable of delivering 340 hp. when loaded to capacity. As each stand of pipe is pulled, the load is lightened, but with the governor holding the engine to constant speed, the hoisting speed remains the same until the load is lightened sufficiently to permit shifting into the next gear. With the speed constant and the load decreasing, the power delivery of the engine decreases with each gear.

It is apparent that the smaller the number of available speeds, the larger will be the drop of power used in each drum speed in relation to the engine capacity. On rigs equipped with torque converters, the speed of

TABLE 4—APPROXIMATE SAFE WORKING LENGTHS OF DRILL PIPE FOR VARIOUS WIRE LINES

		Plow steel, hemp center, 6 by 19 Seale construction (S.F. 4)				Improved plow steel, hemp center, 6 by 19 Seale construction (S.F. 4)			
Size line (in.)	Lines up	3½-in. o.d. 13.3 lb.	4½-in. o.d. 16.6 lb.	5-in. o.d. 19.5 lb.	5½-in. o.d. 21.9 lb.	3½-in. o.d. 13.3 lb.	4½-in. o.d. 16.6 lb.	5-in. o.d. 19.5 lb.	5½-in. o.d. 21.9 lb.
1	6	7,100	5,400	4,800	4,100	8,300	6,300	5,500	4,800
	8	9,300	7,100	6,200	5,400	11,300	8,300	7,200	6,200
	10	11,300	8,700	7,600	6,500	13,200	10,100	8,800	7,600
1⅛	6	8,400	6,500	5,500	4,900	10,100	7,700	6,700	5,800
	8	11,000	8,600	7,500	6,400	13,300	10,100	8,800	7,600
	10	13,700	10,500	9,200	7,900	16,300	12,500	10,800	9,400
1¼	6	10,500	8,000	7,000	6,100	12,300	9,400	8,200	7,100
	8	13,800	10,600	9,200	8,000	16,100	12,400	10,700	9,300
	10	17,100	13,100	11,400	9,900	19,900	15,300	13,300	17,500
1⅜	6	12,500	9,600	8,400	7,300	14,600	11,400	9,800	8,400
	8	16,600	12,700	11,100	9,600	19,500	14,900	13,000	11,200
	10	20,500	15,800	13,800	11,900		18,300	16,000	13,700
1½	6	14,900	11,400	10,000	8,600	17,400	13,400	11,600	10,000
	8	19,000	15,100	13,200	11,300	23,000	17,600	15,300	13,400
	10		18,600	16,200	14,000		21,700	18,900	16,300

Note: (1) Wire lines with independent wire rope center can be satisfactorily used to depths 7½ per cent greater than shown above. (2) Tool joints considered in above table but drill collars neglected. (3) Buoyancy factor used for 10-lb.-per-gal. or 75-lb.-per-cu. ft. mud. (4) Traveling block and hook assembly considered to weigh as follows for each size of line: 1-in., 10,000 lb.; 1⅛-in., 15,000 lb.; 1¼-in., 20,000 lb.; 1⅜-in., 25,000 lb.; 1½-in., 30,000 lb.

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Fafnir Spherical Roller Bearing Pillow Blocks will be distributed in the same manner as Fafnir Ball Bearing Pillow Blocks. First shipments will be made about January 1, 1950. Literature listing the complete range of sizes and types will be available at a later date; meanwhile, your inquiry, with specifications and blueprints, is cordially invited.

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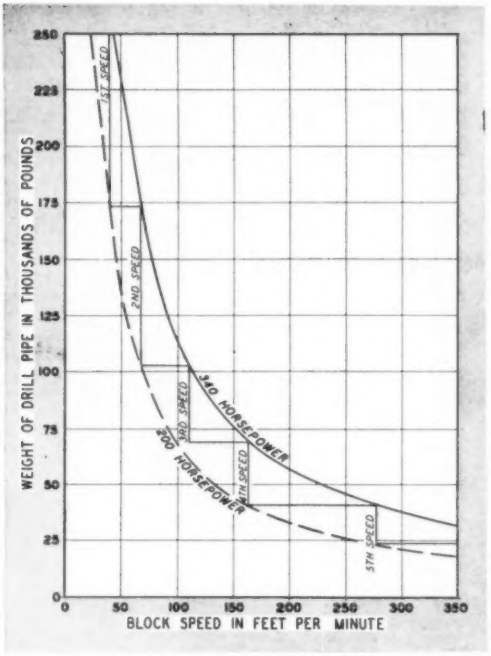

Fig. 1—Power chart for an internal-combustion-engine-powered rig

hoisting in any given gear increases as the load becomes lighter and the power of the engine is fully utilized. The number of gear changes can be reduced on such rigs as the torque converter automatically takes care of a wide selection of speeds.

Auxiliary brakes.—Each draw works should be equipped with an auxiliary brake calculated to absorb and dissipate energy involved in lowering heavy drill-pipe and casing loads. The size of the brake should be developed on the basis of the wire line used and the speed of lowering the block. The speed factor commonly used is equal to lowering a 90-ft. stand in 15 seconds. For wire lines of improved plow steel with hemp centers, the energy that would have to be absorbed for lines from 1 to 1½ in. in diameter would range from 1,000 to 3,500 hp., or more than twice the hoisting horsepower.

Engine Selection

In order to insure satisfactory engine service and provide ample power for the operation of the equipment, it is necessary to inject certain safety factors into the engine specifications. All too often the operator chooses an engine on the basis of the published power curve and finds that his rig is underpowered and the engine overloaded. The usual engine power curve is obtained from data developed with the engine operating under ideal conditions, conditions that are seldom, if ever, attained in the field. Factors that should be considered in choosing an engine are:

1. Anticipated altitude and temperature changes from the standard atmospheric pressure of 29.9 in. of mercury and 60° F.

2. Power requirements for auxiliary engine equipment such as fans, water pump, generator, etc.

3. Mechanical perfection of engine that might vary because of wear or maladjustment.

4. Allowance for a conservative maximum piston speed of approximately 1,000 ft. per minute and a maximum brake mean effective pressure of 80 for an unsupercharged engine.

5. Energy value of the fuel different from the standard test fuel.

Mud-Circulating Equipment

In the slush pump it is advisable, for best performance, to keep the piston speed under 140 ft. per minute mean velocity. The maximum speed in a power pump is determined by the pressure drop in the suction system and the fluid inertia. If these items exceed atmospheric pressure, the pump cylinders will not fill properly and a severe fluid pound will occur. Supercharging of the suction with another pump improves this condition.

In estimating the proper size of pump, the mechanical and hydraulic efficiency of the pump must not be overlooked. This is usually considered to be 85 per cent.

The swivel is another portion of the mud-circulating system that requires careful analysis to properly fit it into the rig requirements. It should normally be able to handle a gross loading equal to the loading of the hook with which it is used. The limiting factor in the choice of a swivel is the load and speed characteristics of the bearings. In hard drilling with heavy weight on the bit and slow rotary speeds, the bearings in a particular swivel would have a much longer life than if the same swivel were operated with light weight on the bit and high rotary speeds.

A bearing rated at 100 tons for 100 r.p.m. would have a rating of only 69 tons at 300 r.p.m. These bearing factors are also very important when choosing a rotary for a particular type of drilling. An interesting comparison of the rotational requirements for various types of drilling is indicated by the following data: 100 revolutions per foot of very soft drilling, 200 revolutions per foot of soft drilling, 450 revolutions per foot of medium-hard formations, 750 revolutions per foot of hard formation, and 1,500 revolutions per foot of very hard formation.

Auxiliary Equipment

Auxiliary equipment should be carefully considered in the design of a balanced rig so that adequate power and facilities are provided. Usual items in this category are lights, mud screens, air compressors, blowout-preventer actuating equipment, washdown pumps, and mud agitators, and bug blowers. These items require 50 to 75 hp. on the larger rigs.

In holes having adverse sand conditions, power and equipment for removing the sand in addition to screens must be provided. On rigs where an auxiliary mud conditioning pump is not installed, mud-mixing equipment of other types should be considered and power provided as required. There are many equipment aids to reduce crew fatigue such as power-operated impact wrenches, tongs, and slips which must be provided to obtain efficient operation and whose power requirements must not be overlooked in assembling a well-designed rig. Another feature that should not

TABLE 5—EXAMPLE OF BALANCED HOISTING EQUIPMENT FOR CALIFORNIA TYPE DRILLING

	Rated drilling depth (ft.)						
Drill-pipe size—	3,000 5 ft. at 19.5 lb.	6,000 5 ft. at 19.5 lb.	9,000 5 ft. at 19.5 lb.	9,000 5½ ft. at 21.9 lb.	12,000 5 ft. at 19.5 lb.	12,000 5½ ft. at 21.9 lb.	15,000 5 ft. at 19.5 lb.
D. P. plus 20,000 lb. D. C. (lbs.)	81,000	145,000	209,000	238,000	273,000	312,000	337,000
Hoist input horsepower	320	640	960	1,080	1,200	1,400	1,500
Wire-line size (improved plow steel—hemp center) (in.)	1	1⅛	1¼	1¼	1⅜	1⅜	1½
Working lines	6	6	8	10	8	10	10
Derrick capacity (lb.)	300,000	450,000	640,000	640,000	860,000	860,000	1,000,000
Derrick height (ft.)	98	128	136	136	150	150	189
Crown block (tons)	150	225	320	320	430	430	500
Traveling blocks (tons)	110	175	260	260	360	360	420
Block sheaves (in.)	36	42	48	48	60	60	60
Hook and swivel (tons)	100	165	250	250	350	350	410
Rotary and swivel (tons at 250 r.p.m.)	40	75	105	120	140	155	170

be overlooked on a well balanced rig is the safety of the crew.

Unitization and Standardization

A balanced rig is also one which is carefully unitized to aid in obtaining low moving costs. Unitization should not go so far as to hamper drilling operations and thus create greater cost than the savings to be realized in moving. The packages into which the rig is broken down should be of legal size and of such bulk and weight that they can be handled safely and quickly with the transportation provided. Care should be taken to make the points of disassembly at such places that dirt cannot invade the open machinery. Proper access for servicing and repair of the equipment must not be neglected when making the rig more portable.

A balanced rig is also one that has as many of the parts standardized as possible. One type of engine should be used when feasible. Engines of the same bore and stroke, but varying in the number of cylinders or the addition of superchargers will provide a variation in power output of the engine units and decrease the maintenance problem.

The use of similar bearings and sheaves in the crown and traveling block makes for better balance. The installation of one type of union or valve also aids economical maintenance. It is sometimes beneficial to standardize on one size of equipment, such as hooks, blocks, engines, etc., to enable an operator with several rigs of varying capacity to have balance between rigs rather than balance in one rig.

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Governors Are Invited

Governors from surrounding states have been invited to attend ceremonies marking completion of Cities Service Gas Co.'s 400-mile Kansas-Hugoton field-Kansas City, Mo., natural-gas pipe line. The $30,000,000 project will be put into service officially October 12.

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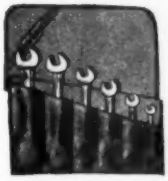

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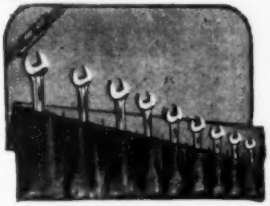

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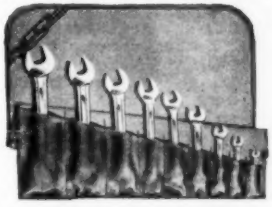

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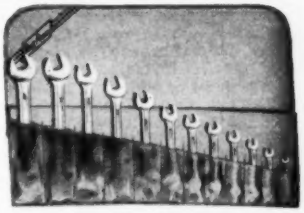

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Operator's Response *to* "Drilling-Contract Forms"

The accompanying article is a summarization of a paper presented by the author before the annual meeting of the A.A.O.D.C., Dallas, in response to a paper presented at that meeting entitled "Drilling Contract Forms," prepared by Hamilton Rogers, Rowan Drilling Co., Fort Worth.

In his paper Rogers said that changes have been interpolated in the language of the contracts without recasting the whole agreements—often confusing rather than clarifying company and contractor relationships. He discussed the concept of "day work" saying that in spite of the "unsaid" section of the contract or the specific contractual definition, practical operating men say that by custom and practice the company takes the risk of the hole and the equipment in the hole while the contractor is on a day-work basis. He suggests this practice should be incorporated in the printed contract, if it is the custom. He feels this should also hold true with respect to custom in the determination of risks where abnormal hazards are encountered.

With reference to the "hold harmless" clause, Rogers said the extent of assumed liabilities under this clause, both as to personal injuries and property damage, has not yet been fully explored, but the general effect is that the contractor underwrites the whole show. Specific reference is made to the Elliff case and its effect in modifying the familiar "rule of capture."

In conclusion Rogers submits that the oil operator, through his executive branches, should outline and approve the basic principles for the new form of drilling contract, patterned along the lines and general principles, customs, and practices outlined in his article.

by Earl A. Brown*

THE drilling-contract form should be as complete, plain, and unambiguous as we can make it. If there is any part of the contract which is not expressed in the written instrument, the entire agreement is ineffective. A drilling contract should express the full agreement of the parties and be tested by the same rules which are applicable to any other contract in which the parties faithfully endeavor to express their mutual rights and liabilities.

This is necessary for several reasons. First, it is a protection to both parties, in performance of a complicated service involving expenditure of large sums of money, to have their rights and duties clearly defined. Secondly, by keeping down misunderstanding, it serves to maintain the fine spirit of cooperation which now exists between the operators and contractors. Thirdly, clarity in obligation is absolutely necessary in cases where the contractual liability is covered by a policy of insurance.

You can be certain that no insurance company will pay off on an "unsaid" provision of a contract, and you may be equally sure it will not assume any liability based on a custom or practice of the industry, unless that custom or practice is clearly made a part of the written instrument. The basis of liability on the part of the insurance company is the written word of the contract, nothing else. It is highly important, therefore, that the contract be clear and complete.

Day Work

I find myself in complete disagreement with Mr. Rogers concerning what he calls "the concept of day work;" and particularly his statement that: "In coring, drill-stem testing, electrical logging, and other instances where work is normally performed on a day-rate basis, the company has the right of control."

Speaking for the form of contract which my company uses, as well as those of several other companies I have examined, I find nothing which transfers the right of control to the operator when day work is being performed, except in certain specific and unusual cases. There may be times when an operator desires to take over the direction of the work when coring, drill-stem testing, or other work of that character is being done, and, if the drilling contractor consents thereto—and his consent must be obtained—then there is a change in the contract, or a novation to that extent, by mutual consent. Such right of control cannot be exercised in such cases by the operator without the specific consent of the contractor, in the absence of a breach of contract.

Independent Contractor Relationship

Probably the most important clause in the drilling contract, as affecting the rights of each party, is the "independent contractor" provision. Such provision is ordinarily stated, in substance, in these or similar words:

"In the performance of the work hereunder contractor is an independen contractor, free of control or supervision by the operator as to the means and manner of performing such work, operator being interested only in the results obtained."

It is only logical and reasonable that the drilling contractor and oil operator should maintain independent relationships toward each other. They are engaged in different businesses. Each is manned by especially trained employes. The machinery and equipment required for the conduct of the one are entirely different from that used by the other. The purpose of one is to drill and case a hole in the ground, and the purpose of the other is to produce oil through that hole after drilling is complete. Each business, therefore, has its own responsibilities, and each should assume its separate obligations.

Right of Inspection

There is another matter, however, which requires mention at this point, and that is the operator's right of inspection of the contractor's work as it progresses. The fact that the operator retains the general right of inspection of the work as it is being conducted, for the purpose of seeing that the contractor meets the requirements and carries out the stipulations of the contract, does not change the relationship of the parties or make the contractor the agent and servant of the operator.

Drilling contracts contain many provisions and specifications as to how the work shall be performed. It is certainly not out of the ordinary for the operator to retain the right of inspection of the work as it progresses, by his representative, who is often a geologist or a petroleum engineer and to call the contractor's attention to any failure to carry out the contractual requirements.

The authorities applicable to this relationship, and there are a number of them, make it a clear distinction between the right of inspection and the right of control. This distinction is not altered by the fact that a contract may give the operator the right to stop the work when it is not being properly done. Stopping the work and controlling the work are not the same.

Briefly, the written contract prevails over an unauthorized act of the operator's inspector, in the absence of unusual circumstances. It follows, of course, that the contractor

*Magnolia Petroleum Co., Dallas. Portion of paper presented at annual A.A.O.D.C. meeting, Dallas.

has the right to refuse to follow directions given by an inspector, when such directions are not authorized by the contract.

"Hold Harmless" Clause

Probably the "hold harmless" clause has evoked more earnest comment and inspired more sharp criticism than any other provision in the contract. Mr. Rogers has given it a great deal of attention in his paper, suggesting that the contractor is required to "pay for the company's mistakes," and that by this clause "the contractor in effect underwrites the whole show."

Those expressions sound like somebody is endeavoring to force an unwarranted liability on the contractor, but let's examine the situation and determine first, whose "show" it is; and second, what the "show" includes. I think it must be admitted that it is exclusively the contractor's show; he is the sole performer. The show is his agreement to "drill and complete" a well "free of control or supervision by the operator as to the means and manner of performing such work." Those provisions do not leave room or opportunity for anybody else to "get into the act."

While the statement of liability in the clause is expressed in comprehensive language, such liability is limited in the clause itself to that "growing out of or incident to contractor's operations under the contract." When we remember that such operations are "free of control or supervision" by the operator, it may be that the clause is not as harsh or inequitable as might appear. Such a clause has been included in drilling contracts for many years, and history doesn't record that it has been an instrument of injustice during that time. A careful reading of the clause fails to disclose anything which would impose liability on the contractor where claims are based solely on the "company's mistakes."

The Claim of Joint Liability

The principal objection which has been raised against the hold-harmless clause is that it requires the contractor to assume full liability for injuries growing out of its operations jointly with some alleged act or fault on the part of the company. There is no denying that this is not only the effect but also the purpose of the clause.

Under Texas law the doctrine of comparative negligence is not recognized. Under such a doctrine, where two or more defendants contribute to an injury, the negligence of each is "compared," so that liability may be apportioned according to the degree in which the actors are considered to have been responsible for the calamity. In Texas, as well as in most other states, no such rule applies.

Where a third person, or his property, is injured and both the operator and contractor are charged with negligence, recovery for the full amount of damage could be had against either party, even though the negligence of one was slight as compared to that of the other.

If a controversy should arise between the operator and contractor, growing out of damages suffered by one of them, a similar application of the same rule would prevail. If it could be shown that the negligence of the injured party contributed in even a small degree to the injury, there could be no recovery, because "contributory negligence is an absolute defense, no matter how negligent the defendant may have been." 30 Tex. Jur. 657.

When the operator and drilling contractor sit down to write a contract one of the things they try to do is provide against the harsh results which would follow from the application of these rules. The only practical solution is to require the more active party to the contract to assume the full responsibility, and indemnify the other in case of loss. I don't suppose anybody would claim that complete justice is accomplished by this method. But it is submitted that justice is more nearly approximated, or at least, injustice eliminated to some extent, by such a contractual provision.

This indemnity clause does have a substantial basis. The contractor is in charge of drilling operations; his

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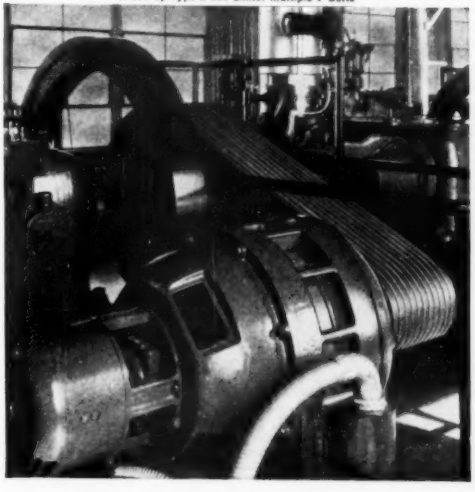

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contract gives him full control; it is his drilling equipment and machinery which are being used; and his own employes are performing the work. Whatever defects there may be in his drilling equipment are known only to him, not to the operator. Whatever the skill or lack of skill, in drilling operations which is possessed by his workmen, is a matter peculiarly his own knowledge.

His experience in drilling oil and gas wells is also a condition concerning which the operator may have little knowledge. Owing to the hazardous nature of the drilling operations, and the fact that the operator must pay a large sum for the drilling —wet or dry—and the circumstance that all operations are under the control of the contractor, it would be strange indeed if the operator did not insist upon a strong indemnity provision.

Contractual Insurance

The usual drilling contract requires the contractor to carry some kind of insurance for the faithful performance of his contract along with public liability and workmen's compensation insurance. Following the decision by the Supreme Court in the case of Eliff v. Texon Drilling Co., 146 Tex. 575, 210 S. W. (2d) 558, on March 3, 1948, some of the companies which have been handling insurance for drilling contractors suddenly decided that their rates were inadequate for the character of insurance covered by their policies. They represented to the Insurance Commission of Texas that the Elliff case had created some new liabilities in connection with underground damage, and thereupon they asked for increases of all rates on underground damage and property loss, even though many of the risks included in their application were not even remotely connected with the facts on which the Elliff case was decided.

In the Elliff case the facts were that Texon Drilling Co. was drilling a well on the lands owned by Elliff et al in Nueces County, Texas, when a blowout occurred and thereupon the well caught fire and cratered. The cratering process and eruptions continued until it spread to other wells which caught fire and burned. This loss went on for a period of nearly 10 years, that is from November 1936 to June 1946. It was claimed that Texon Drilling Co. was negligent in failing to use drilling mud of sufficient weight in drilling its well and that such negligence was the proximate cause of the well blowing out.

The jury found in favor of the plaintiffs and judgment was rendered in their favor for $148,548.19 for gas and distillate loss. The case was defended, said the court, on the ground that under the "law of capture" there would be no liability for loss of gas and distillate which escaped from the premises. The court held, however, that the law of capture would not apply where oil or gas was permitted to escape through negligence, and fixed the measure of recovery at the value of the gas and distillate lost.

The insurance companies contended that they had heretofore depended upon the law of capture to protect them in cases of this kind, and that this decision opened up a vast new field of liability which was either (1) not included in their policies, or (2) if so included, was not assumed knowingly. As a result they asked for increases in rates for all underground operations, including cleaning out, shooting, gun perforating, geophysical work, in addition to drilling. And for good measure, they offered a substitute for the hold-harmless clause in drilling contracts, which would relieve the insurance companies from liability in event it could be established that the operator's negligence may have contributed, even in the slightest degree, to the act which occasioned the loss.

The operators and drilling contractors joined their forces against what was felt to be the unwarranted demands of the insurance companies,

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and several hearings were held before the insurance commissioner. With the statement, or implication, of the insurance companies that prior to the decision in the Elliff case the law of capture precluded any liability for underground damage we took direct and vigorous issue. It has been the law in Texas for many years that one whose negligence causes underground damage to his neighbor's property is liable therefor.

The results of our hearings before the commission was not as satisfactory as we would have liked for it to have been, the final outcome being briefly as follows: (1) The application of the insurance companies was rejected in part, especially as to those operations which were not included in the Elliff case and which the commissioner found to have been theretofore covered by the insurance companies with full knowledge of the nature of the risk. (2) The application for a new rate on underground damage by blowouts, etc., was rejected and in lieu thereof the commission made this risk subject to an "a" rate, which means that the rate in each policy of insurance written is to be determined and approved by the commission on the basis of the actual facts of the case. No action was taken on the suggestion as to the hold-harmless clause.

At the conclusion of the hearing before the commissioner we thought that substantial relief had been afforded against the demands of the insurance companies, but the results have been disappointing. In the individual cases submitted for an "a" rate the insurance companies were granted nearly all they asked for in the original application. This is true, although the industry offered a mass of evidence to show that in comparison to the number of wells drilled in the last 15 years only a ridiculously small percentage of them ever had a blowout. The insurance companies offered no evidence to refute these facts. Also, we showed by uncontradicted evidence that the use of blowout preventers and other improved methods, which have been put into practice during the last 10 years—or since the Elliff well had its blowout—has materially reduced the possibility of such hazards.

However, the insurance companies refused to recede from their demands, basing their position entirely on the Elliff case — where the blowout occurred more than 13 years ago.

During the hearing, the commissioner expressed the opinion that the rates asked by the companies were excessive, but said also that the commission would have to take into consideration the possibility that insurance might not be available unless the insurance companies were willing to accept the rates which the commission might find to be reasonable.

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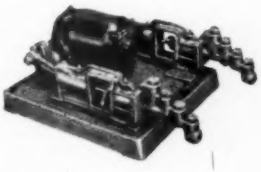

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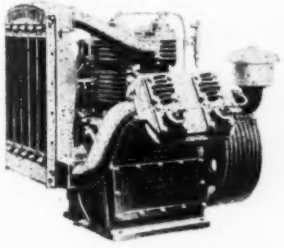

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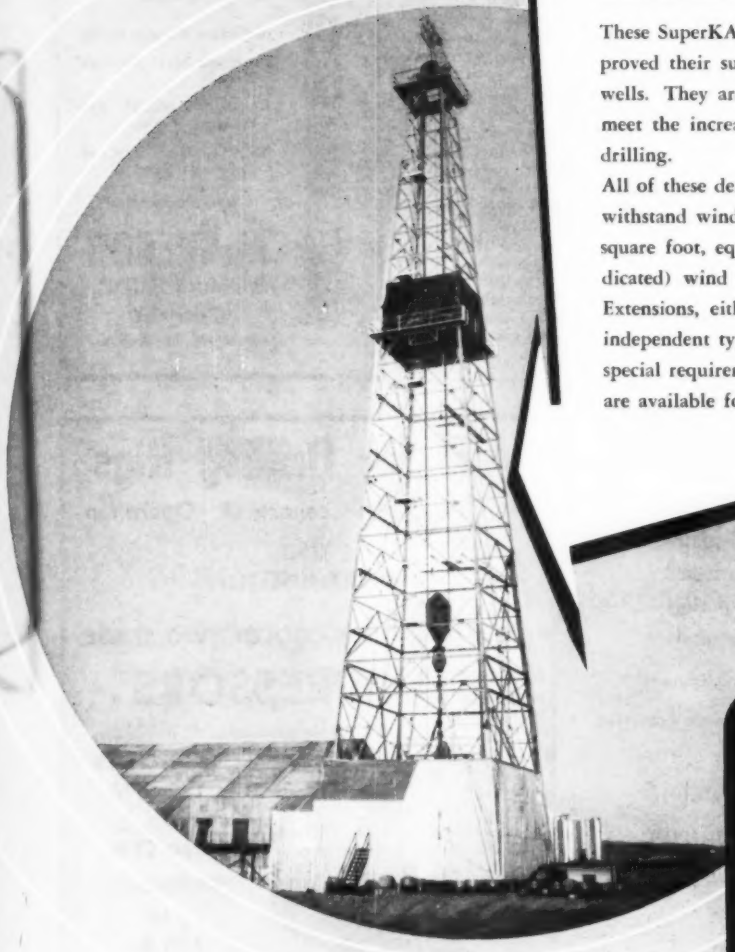

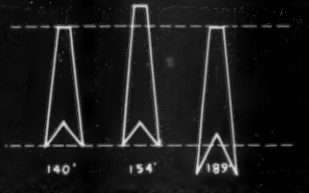

The 140' structure is the basic size of these SuperKAY's. The 154' is made by adding to the top of the 140', while the 189' is made by adding to the base of the 140' structure.

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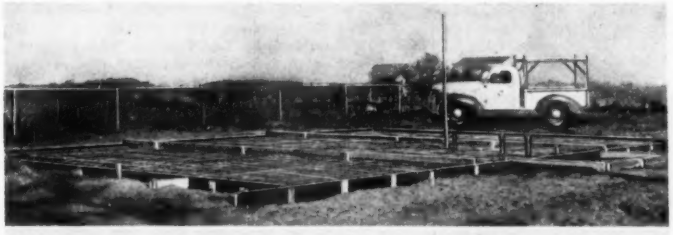
TROPICAL *Oil-Field* HOUSING

Here is shown a finished aluminum prefabricated house, landscaped and occupied. Floor plans of two and three-bedroom houses are shown at left

Homes for personnel use insulated aluminum panel construction, prefabricated and preerected

THE housing of oil-field personnel in tropical regions has always been a problem to oil-company management. The problem is especially grave when administrative and technical employes and their families are involved. Many, if not most in this particular group, are recent arrivals from more temperate climates, and lack of suitable quarters may mean expensive turnovers, the indirect costs of which may be much greater than that of adequate housing. As most operations are in remote areas, far removed from skilled-labor sources, the cost of construction with local materials may be prohibitive.

One West Coast general contractor, who specialized in oil-field construction, has foreseen the need for an aluminum prefabricated house which would be not only suitable for tropical climates, but could be dismantled and moved to a new location with a minimum of cost and trouble. Engineering skill has been incorporated in design, manufacture, and erection of these prefabricated buildings. Top skill has designed the wiring, piping, and plumbing to make installation an easy task. Each unit is completely assembled, wired, and plumbed, then disassembled and placed into specially designed shipping crates. Bolts, nuts, and loose parts are shipped in individual plastic waterproof cartons



These views show steps in erecting the house. In the upper view, the reinforced concrete slad has been poured. Angle-iron templates are imbedded in the perimeter for securing outside walls. In the lower view a six-man crew is placing one of the roof panels in position. Special handling sticks facilitate assembly

which contain a material list and bilingual printed erection instructions.

Work, such as plumbing and wiring, is completed before shipment by the manufacturer. All plumbing is unitized into a panel located between kitchen and bath. Copper piping is used throughout and all outlets terminate 2 ft. outside the house. Only water-supply lines and sewage piping need be connected on the job site.

Each panel is internally wired with three-color coded circuits. When the panels are placed in position, like colors are matched, and the circuits are then completed with a quick-fastening connector without soldering. Panels are fastened to the foundation bolts and to each other with a simple bolting arrangement. All tools needed are included in the shipment.

Two Floor Plans

Two floor plans are available (see accompanying illustration). The three-bedroom house has an area of 1,035 sq. ft. and the two-bedroom layout has 810 sq. ft. Regardless of arrangement, all plumbing and electrical fixtures are supplied in accordance with customer's specification, so that a minimum maintenance stock is needed.

When a house is erected, it is complete in every detail, right down to the soap dish in the bathroom, front doorbell, and mailbox. Each building is primed and painted before shipment.

Inside walls are painted in a choice of colors. Steel or aluminum windows are factory glazed. Polished chrome hardware is standard throughout.

When erected, these prefabricated aluminum houses have the appearance of a wood-frame stucco building. Sand is sprayed on with the first coat of paint, and when the second coal is applied the surface has the appearance of stucco. Walls and roof are large insulated panel units. The insulation is a new cellular type, having a U factor of 282 which is sealed in place at high temperature with a plastic cement. The over-all arrangement has a heat-transfer rate of a wood-frame stucco house with mineral-wool insulation.

Ordinary sounds are not transferred, due to the dead air space in the insulation and it is even possible to nail picture-hanging devices to the wall. The nearly airtight joints are permanently verminproof and the house is almost completely dust tight.

Each house is equipped with modern utilities, including tub and shower, water heater, toilet, washstand, enameled steel kitchen sink, and laundry tub, the latter in a service porch. Enameled-steel wall and floor cabinets are featured in the kitchen, which is well arranged with plenty of cupboard space. Very large wardrobes are built into the house.

Erection Simplified

A floor template may be shipped separately so that the foundation can be prepared in advance of erection of the prefabricated sections. Anchor bolts may be grouted into position, or shot into the concrete with a concrete gun. After the key inside walls are raised, the outside walls and roof are fastened into position and unitized plumbing grid installed. Utilities are then connected and asphalt tile laid for flooring. The total erection time, with a six-man crew, is approximately 400 man-hours. The packing crate is so arranged that the units first needed are on top, and so on down through the crate.

A complete three-bedroom house of this design may be shipped in one 8 by 10 by 22-ft. crate. Weight of crate and contents is approximately 16,000 lb. The package may be divided into smaller units, depending on the unloading facilities available. Crating lumber may be used for construction forms and other purposes, or a small building can be made out of the material.

These aluminum prefabricated units are made by Key Contractors, Inc., Santa Fe Springs, Calif.

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QUESTIONS on TECHNOLOGY

by W. L. Nelson
Consulting Engineer

Estimating Flash Point

How can be estimate the flash point of the products that will be produced when we are designing a unit? We mean designing a unit for future construction.—R. P. D.

Supposing that adequate provision is made for fractionation, steam stripping, and freedom from contamination, it should be possible to estimate flash points within a range that can be cared for by normal changes in operating conditions. There are, however, theoretical reasons for **not expecting** to develop a simple and at the same time an accurate relationship between flash point and the routine properties of the material.

The approximate relationship between flash point and the 0-10 per cent boiling range of the material have already been published on the Questions on Technology page *(Amounts of Steam Required for Stripping, March 2, 1944, page 72, and Flash Point of Crude Oil, November 17, 1945, page 284)*:

For stocks = 0.64 T—100

For crudes = 0.57 T—110

in which T is the temperature (° F.) of the 0-10 per cent distillation range. Inaccuracy arises because of the several different flash-point instruments used and because the average 0-10 per cent distillation range cannot be accurately estimated. The pronounced effect of low-boiling or 0-10 per cent boiling-range material is indicated in Fig. 1 which shows the effect of adding a 104° F. flash-point naphtha to a 410° F. flash point S.A.E. 40 lube oil. The data were taken from the master's thesis of Haidar Ali-Ahmed at University of Tulsa (1949), "Correlation of the Flash Point Temperature with the 'Initial Equilibrium Flash Vaporization' Temperature and the Vapor Pressure of Petroleum Products." Note that 0.2 per cent naphtha lowers the flash point from 410° F. to about 295° F., whereas 5 per cent of naphtha is required to lower the flash point to 180° F. (twice as much lowering).

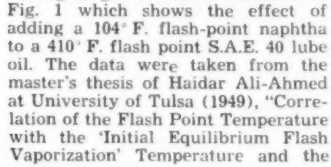

Fig. 1—Flash points of mixtures of S.A.E. 40 lube oil (410° F. flash point) and 387-end point naphtha (104° F. flash point)

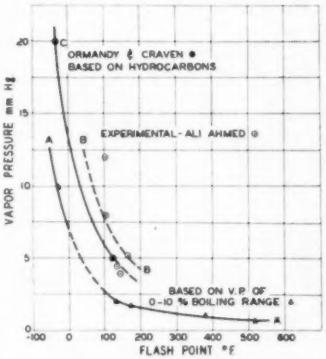
ORMANDY & CRAVEN
BASED ON HYDROCARBONS
EXPERIMENTAL - ALI AHMED
BASED ON V.P. OF 0-10 % BOILING RANGE
VAPOR PRESSURE mm Hg
FLASH POINT °F

Fig. 2—Approximate relationship of flash points to vapor pressure at the flash point

Method Not Accurate

Inasmuch as flash point involves the formation of an explosive mixture of oil vapor and air, and inasmuch as air-oil vapor compositions are a function of vapor pressure, there should be a relationship between flash point and the vapor pressure (at the flash temperature). This method is also not very accurate because of the difficulty of determining the vapor pressure which in turn is related to the shape of the 0-10 per cent distillation range. Ormandy and Craven (Physico-Chemical Significance of the Flash Point, J. Inst. Pet. Tech., 8, 145, 1922), find for pure hydrocarbons that the vapor pressure at the flash point is a constant and that the flash point is a constant fraction of the absolute boiling point. An investigation of this relationship indicates a vapor pressure of 5-20 mm. at the flash point and that the flash point occurs at about 0.71 to 0.775 of the absolute boiling point. Application of this method to mixtures is, however, difficult because of trouble in defining the boiling point of mixtures. Vapor pressures at the flash point are shown in Fig. 2 taken from the Ali-Ahmed thesis and from values estimated in "Flash Tests Useful for Judging Application of Light Oils." *(The Oil and Gas Journal, September 1, 1938, page 42.)*

Finally, the "zero per cent point" of the equilibrium flash vaporization curve or the bubble point is considerably governed by the front boiling-range material and hence Ali-Ahmed examined this relationship. He found the following relationship which was accurate within plus or minus about 3 per cent (average error 1.3 per cent):

$$F = 0.855\,T - 188$$

where F is flash point (° F.) and T is the bubble point (° F.). In determining the bubble point as the zero per cent point (initial equilibrium vaporization temperature) of the flash vaporization curve, the curve must be corrected for front-end curvature, and this casts considerable doubt on the usefulness of the method.

Rubber Asphalt Roads

Is it true that rubber is used with asphalt for roads?—R. L. P.

Even in 1870 a rubber road was laid outside the Midland Grand Hotel at the San Pancras railway terminal in England, and a number of such roads have been built in London and its vicinity. This development was discussed by C. Ridley in Petroleum (British) April 1944, page 59. The use of asphalt-rubber mixtures has also attracted attention. J. M. Van Rooijen published "The System Asphaltic Bitumen-Rubber Powder" in Ind. Eng. Chem., 33, 820 (1941). The July issue of Aminco Laboratory News states:

Rubber-asphalt roads will soon be available in three states for testing purposes, according to the Rubber Development Bureau, Washington, D. C. These roads will follow the pattern of prewar-built roads of this type in Holland and Java which withstood heavy military use during the war years, indicating the value of this road surface.

The road surface is a mixture of powdered natural rubber in asphalt. About a ton of the rubber is used for 3 miles of the ordinary-width asphalt road. The advantages claimed include decreased maintenance costs, longer life, better protection for foundation materials, excellent nonskid qualities, and a smoother, more water-resistant, and dust-free road surface.

Test sections of rubber-asphalt surfaced roads are to be built in Virginia, Ohio, and Texas, according to the Dutch method. The rubber to be used is to be supplied by the Dutch Rubber Foundation in Delft, Holland. The director of this foundation, Dr. Ir. R. Houwink, recently came to the United States to explain to engineers the technical aspects of this type of road. F. T. Bokma, of the same organization, will remain in this country to supervise the laying of the test sections. They will be constructed under the sponsorship of the three official highway departments.

by C. J. Paine* and Jerry Stover†

THE question most often asked regarding radio communication for the drilling industry is: "What does radio save you?"

We know that mileage has dropped off on field cars, and trucks are getting a job done quicker and with less travel. We know that telephone bills are less, but with the varying activity in different localities that a drilling firm encounters, trying to put the finger on actual savings is a hard task.

By applying a sort of flexible formula to day-work billings to customers, we find that they are about 30 per cent less than they were before we started using radio. That has a double-bitted advantage. We have never been able to charge a rate for day work, because of competitive conditions, that would allow us to break even. Therefore, the more day work we billed, the greater the loss. On the other side of the fence, the producer was spending his dollars on day work beyond what he now spends. With radio, both the producer and contractor are saving.

How does this saving occur? In the area where we work there are several sands and limes capable of producing oil. From location to location these sands vary, to the extent that almost all the wells drilled in the area are wildcats. Under the old system, when a sand was encountered the rig was immediately shut down until a representative of the company could be contacted. This sometimes took several hours. Now the wait is usually less than 15 minutes. When a driller gets a change in drilling time he will immediately contact with the geologist or engineer in the area by radio, give him the dope, and then follow instructions by radio from then on even while the company man is on his way to the location in his car. The same plan works on wildcats. Instead of the company having an engineer, or two of them, on the location sweating it out 24 hours a day, one man can easily and efficiently check two or three wells in the area.

Radio has made a direct contribution to efficiency. In years past most pushers felt that to get a good job done they must stay on the job most of the time, day and night. There was always that constant fear in their minds that if they left something would happen. And lots of times it did, just as they drove around the corner, with the result that a rig might be shut down for several hours. This kind of thing didn't exactly contribute to good sleep and peace of mind and sometimes a pusher would be so worn out from lack of sleep that he didn't deliver his best in the clutches.

Radio has helped eliminate this to a great extent. Since we have radio stations in all pushers' houses, a man can now go home at a reasonable hour and go to sleep knowing that if anything out of the ordinary happens he will know it within a few moments. Many times this means a trip back to the rig with supplies; more often it means that the problem can be discussed with the driller and the solution be worked out without the pusher leaving his bedroom. At all times it means that a pusher can go to sleep without worry.

Truck dispatching has really paid off. There are fewer empty return trips with radio-equipped trucks, and when something is needed in a hurry a truck can always be found and usually that truck will be near enough to what you want that a lot of time is saved. This also means less shutdown time for the rigs.

About the only characteristic common to all drilling-rig radio systems is that they use radio! There is no such thing as "standard package." While this is true of nearly every radio system, it is particularly true of drilling systems. Rigs are different, area of operations are never the same and, most important, each drilling contractor has his own idea as to how he wants to use radio.

Fortunately, radio is an extremely flexible tool and can be adapted to almost any type of operation. However, to get the most out of any radio system it must be properly engineered. To do this, even with the assistance of a radio engineer, the contractor should know what the various elements of a system are, what they will do, what they won't do and how much each costs.

Elements of a Two-Way System

A two-way radio system for drilling operations is usually a combination of three basic elements:

1. The mobile unit in cars and trucks.
2. The portable unit on drilling rigs.
3. The office station.

The mobile unit consists of a transmitter and receiver, usually mounted in the trunk of passenger cars and in tool boxes on trucks. The output of the transmitter is usually 30 to 60 watts. The antenna is a steel whip and spring. It can be mounted on the roof or side of the vehicle. The

*Paine Drilling Co., Dallas, and †Consultant, Dallas. Portion of a paper presented at ninth annual meeting American Association of Oilwell Drilling Contractors, Dallas.

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standby battery drain of the mobile unit is only slightly greater than that of a normal car radio—about 9 amp. Heavy current drain is only during the transmitting time.

For this reason, heavy-duty batteries and slow-speed generators are required only if the car does a great deal of city driving where the normal generator does not turn up enough to build up the batteries.

The calls to a mobile unit are received over a small metal-cased speaker. It is mounted up on the firewall and does not interfere with the normal car radio. The small control unit is mounted under the dash. Two types of microphones are available. The small military type mike is used in a large number of systems but the handset type is more popular in oil-field use because the receiver adds a great deal to the readability of a signal when the car is going fast or in a noisy location.

The portable unit on drilling rigs is usually mounted in a portable steel cabinet with provisions for power supply. Instead of the whip antenna of a mobile unit, however, a special coaxial antenna is mounted atop the derrick and connected to the radio by means of a small flexible cable.

The storage battery is mounted at the rear of the cabinet and kept charged by a generator mounted on one of the drilling engines. Steam rigs use a turbine-driven generator and those rigs where 110-volt power, either a.c. or d.c., is continually available can use a converter or charger. While the battery-generator combination is a little more trouble than a straight a.c. unit, it has the big advantage that while rigging up, or during an engine breakdown, the radio can be operated from the battery for a limited time. If the battery goes down, it is a simple matter to exchange it for a fresh one from a car or truck.

The radio cabinet is normally placed in the dog house beside the knowledge box. So that calls may be heard on the rig floor a small weatherproof speaker is mounted near the draw works. The driller can then hear if his rig is being called and step into the dog house to answer.

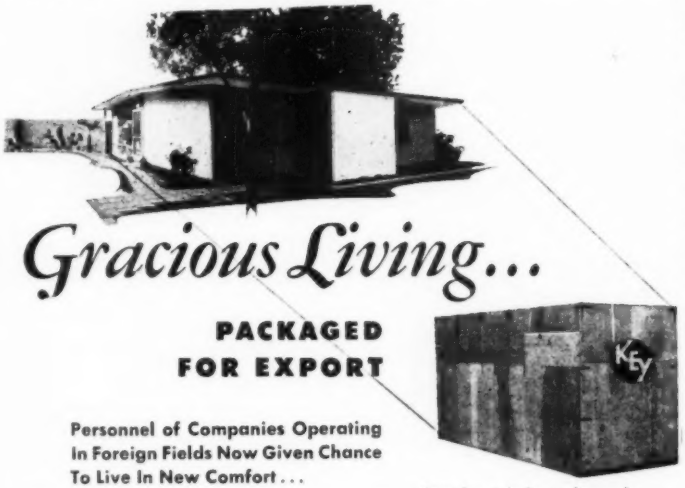
The office station used by most drilling companies is a 50-watt unit. It is very similar in appearance and operation to the rig units. In fact, if good dependable 110-volt a.c. power is available it could be used on a rig. Office stations with 250 watts output are frequently used. The extra power permits the station's signal to be received better in a location where the electrical noise level is high. For example, a mobile unit may be driving along a power line or the station on the rig may be receiving excessive interference from the light plant or magnetos. The higher-powered office station does not necessarily increase the two-way communications range because the "talk back" power of the rig or car is still only 50 watts.

The antenna of an office station is usually placed on a tall tower in order to give it maximum range to cars and rigs. This tower may vary from a 40-50-ft. pipe mast at a tool pusher's house to a 150 to 300-ft. lattice steel tower.

Station Antenna Location

It is true that the frequency-modulation type of radio is relatively free from static interference. Diathermy, X-rays, certain motors, neon lighting, etc., interference can reduce the range by as much as 50 per cent. For this reason, a station with its antenna located in the downtown area of a city will have limited range. The selection of a "quiet" location for the office station is probably one of the most important items in the planning of a system. If there is any doubt about the location the noise level of the area should be checked before going ahead with a tower and station.

The office station can be remotely controlled from one or more locations. Thus, the tower and station can be placed in a quiet location on the edge of town and controlled, by means of leased telephone wires, from a downtown office. A second control unit can be installed in a residence, possibly



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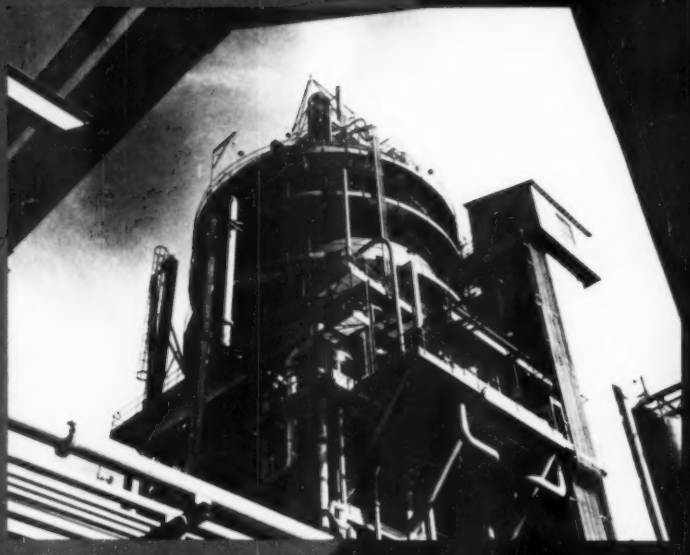

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that of the drilling superintendent, to receive night calls.

Range of Radio Systems

The very short waves used by these systems can be shielded by hills and the horizon. Fortunately, they do bend to some degree, however, and communication is possible beyond actual line of sight. For this reason, maximum range is obtained by having the antenna high and in the clear, keeping in mind, of course, the necessity for having a location free from electrical interference.

The antenna on cars and trucks are only a few feet above ground and the range between two such units is seldom more than 20-30 miles. Because the antenna of a rig station is usually 120-140 ft. high it can send and receive messages to cars 40 to 50 miles away. To another rig or an office station the range will be even greater due to the fact that the antennas at both ends are high. This will be 50-70 miles depending on the elevation of the rigs and the height of the office antenna.

The most spectacular increase of range is known as "skip" and is caused by the ionosphere (several hundred miles high), acting as a mirror and reflecting the waves from your station back to earth hundreds, or even thousands, of miles away. This causes stations to be picked up as far away as South America or even Africa. Because they come down out of the sky skip signals can be heard in a car as easily as they can at a rig or office station. These conditions occur frequently during the summer.

The other type of range increase is known as "bending" and is much more useful than skip. Bending occurs most frequently in the early morning or evening and is due to the moisture in the air causing the radio waves to bend around and over the horizon. It doubles, or even triples, the normal ranges, and communication between rigs and cars 70 miles apart has been obtained. Unfortunately, this blending cannot be depended upon for consistent communication. It may last a few minutes and seldom lasts more than a couple of hours.

However, the consistent range from an office station to cars and rigs can, in some instances, be increased up to 70 and 100 miles, respectively, by using directive antennas. These antennas concentrate the radiation in a given direction and effectively multiply the power of the station by as much as 10 or 15 times. As the same antenna is used for receiving, it picks up the power of the incoming signal by a like amount.

The directive antenna provides this increase in only a limited sector and at the expense of range to the remaining areas. Thus such an antenna can be used only if the office is primarily to one side of the operation. For example, it would be difficult to use a directive antenna if operations were scattered a considerable distance in all directions from a central office.

A typical example of directive antenna operation is the one used by Fain & McGaha Oil Co. at Wichita Falls, Tex. It is a 6-element unit, having a power gain of 10 db., 300 ft. high. With a 50-watt transmitter it provides reliable communication range, in its beam, of 85 miles to cars and 110 miles to rigs. The range off to the sides and back is only 35 miles to cars and 50 miles to rigs, however.

FCC Regulations

On July 1 of this year the Federal Communications Commission issued new rules and regulations for the mobile radio service. These rules established a petroleum radio service and provided for the assignment of 30 exclusive frequencies for the use of the petroleum industry.

Up until that time radio in the petroleum industry had only three shared frequencies on an experimental basis. These three channels quickly became overloaded. In 1947 the Central Radio Committee of the A.P.I. made formal representation to FCC for the establishment of a permanent petroleum radio service with additional exclusive frequencies.

All radio stations must be licensed by FCC. Upon proper application and showing of eligibility, FCC will grant the license with the frequency and call letters. There is no cost for these permits and the small fellow with one rig and a car can obtain a license just as readily as a major oil company. Before filing for an FCC license it is necessary to obtain a frequency recommendation from the Petroleum Coordinating Committee.

The necessary FCC forms and assistance in their preparation can be obtained from the FCC district offices. Also, the various manufacturers representatives selling radio equipment have them and are, of course, only too glad to help prepare them, without charge.

Due to the release of these new frequencies there has been a tremendous flood of applications and FCC has a rather large backlog. In planning the installation of a system it is well to allow at least 6-8 weeks for the processing of the license application by FCC.

Costs

Initial cost of good radio communication is not cheap, but by effective planning and study, the cost of a system can be kept within reasonable limits. The costs of the individual elements of a system will vary to some degree, depending on type of equipment and installation labor costs. The figures here, however, are average throughout the Southwest and are sufficiently representa-

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tive to be used for budget purposes. These costs, of course, include all necessary labor and the various accessories.

The cost of a mobile station installed in a car or truck is about $600. The rig station, with its special accessories such as battery, cabinet, generator, rig antenna, etc., is about $950. The cost of the office station varies considerably depending almost entirely on the antenna height required. The tower is usually the most expensive item. A 180-ft. lighted tower costs $2,200 erected. A 50-watt office station with such a tower will run about $3,200. Thus, a system consisting of four cars, five rigs, and an office station would cost a little over $10,000 installed.

All repairs or adjustments to the equipment must be done by an engineer with an FCC license. It is not necessary to have such a man on your payroll as maintenance service is available on a per-call or contract basis.

It is unlikely that there will be any major reduction in equipment or operating costs in the foreseeable future. One reason for this is that as more and more users come on the air the FCC technical specifications must, of necessity, be increased to reduce the interference. Thus, any advantage gained by quantity production will be offset by the increased cost of manufacturing and maintaining equipment to the more rigid specifications.

Progressive Training Program

(Continued from page 80)

operators just entering supervisory capacity and new employes with previous experience as supervisors outside the refining industry. For this classification, group discussions on over-all plant operations were instituted to give each trainee the necessary conception of the whole refinery. Process engineers and other high-level company representatives took a major part in this training, and the groups were instructed by specialists in process, power, laboratory, safety, and other fields.

Small Groups Used

Basic training in the lower classifications was also handled in small groups. New employes were first oriented to their respective departments with information on supervision, line of promotion and introduction to other departmental personnel. Then followed instruction on the relation of their departments to refinery operations generally.

Craftsmen in the maintenance department come to the plant already fully trained in their basic crafts. Their plant training comprises orientation to refinery operations and introduction of company standards and techniques. The maintenance nature of their work allows this training to continue after initial plant startup, hence their brief training period prior to full refinery operation.

Instruction on departmental working rules, operating standards, safety practices, and fire protection was followed by training in the care of equipment, utilization of tools, materials, and utilities. Detailed study of department units and processes rounded out the basic training for process employes. For maintenance personnel, additional training was given in care of equipment, standards, and procedures. For maintenance workers, vocational training in the various crafts will be expanded after the plant assumes normal operation.

On-the-Job Training

Without an operating refinery, the second phase of training has varied from the routine method of learning while doing. As far as possible, the new units are employed in dry runs to simulate the established teaching sequence; tell him how, show him how to do it, let him do it. For many classifications, in-plant training has been supplemented by tours of duty in several of the company's operating refineries where units similar to those at Eagle Point are installed. Additional training for some specialized groups has been provided by manufacturers in their plants and schools.

Instrument men, for example, are given an intensified 6 months of training considered equivalent to 2 years of normal in-plant experience. In addition to their basic training and a modified J.I.T. course, lectures at Eagle Point were scheduled by visiting representatives of six instrument and control manufacturers. Instrument courses ranging from 1 to 7 weeks were then taken at the nearby plants of Brown Instrument Co., Leeds & Northrup Co., and Fischer & Porter Co. Plant training in maintenance then followed at the company's Lockport Works after which trainees return to the new plant to begin work on calibration, cleaning lines, and tracing out and installing identification plates on all plant instruments.

The concept of training as an important tool of production will receive an acid test as the Eagle Point Works goes on stream this fall. Full confidence in the merits of the company's progressive training program is revealed in plans to initiate operation with few additional personnel over those assigned to regular operation. Management's confidence is reflected in the attitude of employes at Eagle Point, who have responded with a high degree of cooperation in the training program. It is significant that the outstanding reaction on the part of new employes with previous industrial experience is one of surprise and appreciation at the comprehensive training offered in advance of actual job performance.

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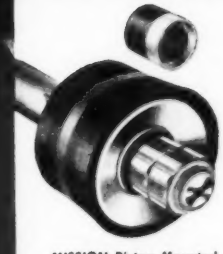

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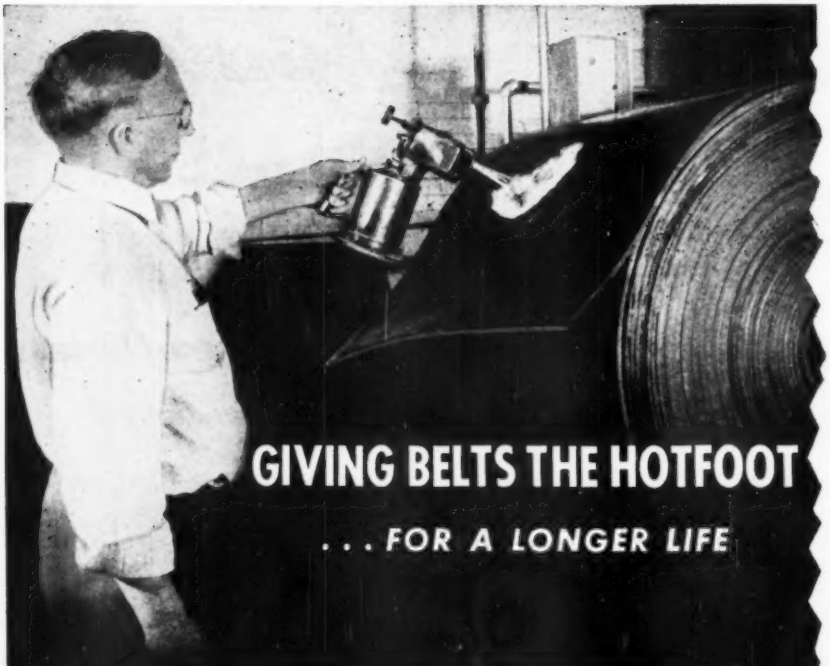

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A WEEKLY FEATURE OF THE OIL AND GAS JOURNAL

Excavation, Concrete, and Foundations

TABLE 1—APPROXIMATE COSTS (1946) OF FOUNDATIONS AND MATERIALS

Material or job—	Unit	Material	Labor	Total
Sand, truck lots or more	$/ton	*1.14-2.50	0.50	1.64-3.00
Rock	$/ton	2.00-3.00	0.85	2.85-3.85
Cement, c.l. lots	$/bbl.	1.90-2.70	0.12	2.02-2.82
Cement, smaller lots	$/sack	0.60-0.84	0.05	0.65-0.89
Reinforcing steel	cents/lb.	5-8	1.5-2	4.5-6
Mix and place concrete	$/yd.		3.0-4.0	3-4
Bases for foundations or roads	cents/sq.yd.			26-35
Mortar finish	cents/sq.ft.	3	3.5	6.5
Excavation, small	$/yd.		1.50-2.50	1.50-2.50
Forms, pump or foundations	cents/sq.ft.	9-10	24-28	34-37
Forms, roof slab or beams	cents/sq.ft.	21-24	11-13	33-36
Concrete foundations, rough small	$/yd.	9-11.5	9-16	19-26
Concrete foundations, finished small	$/yd.	14-17	20-23	36-39
Concrete floor slab, 7-in.	$/yd.	13-15	15-18	30-32
Concrete columns (encasing), low	$/yd.	16-18	22-25	39-42
Concrete roof slab including beams	$/yd.	16-18	20-22	37-39
Concrete steel (encasing) secondary members	$/yd.	16-18	60-70	76-88
Concrete columns (encasing) up to 30-ft.	$/yd.	16-18	100-110	116-128
Concrete ready mix, 1:2:4 50 cu. yd. or more delivered	$/yd.	5.60-9.50		5.60-9.50
Concrete in dams, 10[6] yd.	$/yd.			8.00
Concrete in dams, 10,000 yd.	$/yd.			13.00

*All major cities except Denver where it was under $1 per ton

TABLE 2—APPROXIMATE COST (1946) OF CLEARING, GRADING, EXCAVATION, ETC.*

Description—	Unit	Labor
Grubbing, thick brush	$/acre	250-350
Clearing land, thick pine growth	$/acre	180-240
Clearing land, thin stand, small trees	$/acre	40-45
Shoveling:		
Sand and loam, regular	$/cu.yd.	0.90-1.00
Clay or heavy soil	$/cu.yd.	1.15-1.35
Hard pan	$/cu.yd.	1.35-1.60
Blasting, air drill (1-2 lb. dynamite)	$/cu.yd.	0.85
Grading:		
Gravel or loam	cents/cu.yd.	4.5-5.0
(tractor) fairly tight clay	cents/cu.yd.	6.0-7.0
Very hard soil	cents/cu.yd.	11.0-15.0
Grading, ripper plow and tractor:		
Gravel or loam	cents/cu.yd.	1.0-1.2
Fairly tight clay	cents/cu.yd.	1.5-1.7
Very hard soil	cents/cu.yd.	2.4-2.7
Scraping, tractor, 200 ft.:		
4-ft. scraper, 15 hp.	cents/cu.yd.	19-22
6-ft. scraper, 30 hp.	cents/cu.yd.	15-17
10-ft. scraper, 60 hp.	cents/cu.yd.	12-15
Excavation, large, road, common	$/cu.yd.	35-40
Excavation, large, road, rock	$/cu.yd.	1.20-1.65
Excavation, large, dam, common	$/cu.yd.	0.40-0.47
Excavation, large, dam, rock	$/cu.yd.	2.05-2.15
Excavation, large, dam, borrow	$/cu.yd.	0.33-0.40
Excavation, small, common, 100 yd.	$/cu.yd.	0.90-1.40
Excavation, small, rock, 10 yd.	$/cu.yd.	4.00-6.00
Excavation, very small	$/cu.yd.	1.50-2.50

*Heinecke, G. W., Pet. Engineer, Dec. 1932, p. 21; Engineering News Record, March 1949; and author's files.

THESE costs vary widely but since they compose only about 6 per cent of the basic equipment cost or only 1.5 per cent of the total cost, the values given here should be adequate. The sizes of tower or stack foundations can be estimated from Refiner's Notebook No. 53, Self-Supporting Foundations for Towers or Stacks (August 4, 1945, page 103).

TABLE 3—VOLUME OF CONCRETE FOUNDATIONS* FOR ENGINES

Type of equipment—	Cu. yd. per b.hp.
Oil Engines:	
Single cylinder, horizontal	0.5-0.6
Twin cylinder, horizontal	0.4-0.5
Multicylinder, horizontal	0.3-0.4
Twin cylinder, vertical	0.4-0.6
Gas Engines:	
Twin tandem, horizontal	0.3-0.4
Single tandem, horizontal	0.4-0.5
Single tandem, gas blowing engines	0.5-0.6
Single cylinder, horizontal	0.5-0.9
Single cylinder, vertical	0.4-0.6
Multicylinder, vertical	0.3-0.4

*Depth should be 5-6 times the cylinder diameter and piles or special footing structures are not included.

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ENGINEERING fundamentals

Concept of Two-Stage Separation

ONE can remove a given hydrocarbon mixture from reservoir conditions to some standard surface conditions by subjecting it to one or more separations. The number of separations used and the pressure and temperature of each one will affect the number of cubic feet of surface gas produced, the volume of surface oil produced, and the gravities of both the oil and gas. An understanding of this effect is most readily grasped by considering two separations in a two-component system.

Consider a system with the components n-hexane and n-butane, in the ratio of 4 mols n-hexane to 6 mols n-butane. Let the system be at 200° F. and under sufficient pressure that the mixture exists as liquid only. For simplicity let the temperature on the ensuing separations be always 200° F., and let only the pressures be varied.

In a previous article (Engineering Fundamentals No. 384) it was calculated that the bubble-point on the above mixture at 200° F. would be 121 psia. and that the dew point at 200° F. would be 60 psia.

For purposes of illustrating the concept let the final conditions to which the mixture is brought be 200° F. and 60 psia. By a single-stage drop from original conditions (all liquid) to this pressure, therefore, the resultant recovery would be all vapor and no liquid, because as has been noted above this is the dew point pressure for the mixture.

To show the effect of two-stage separation, assume an intermediate separation at 90 psia. and 200° F. The mol fraction of butane found in the liquid at this condition is computed from

$$\text{x-butane} = \frac{1 - \text{k-hexane}}{\text{k-butane} - \text{k-hexane}} \quad (1)$$

as shown in Engineering Fundamentals No. 383. The values of k-hexane and k-butane at 200° F. and 90 psia. are found on the appropriate equilibrium constant charts to be 0.365 and 1.98. By substitution in Equation 1 it is found that x-butane is 0.395. x-Hexane is, therefore, 0.605. The composition of vapor separated can be found from the expression $y = kx$ for each component. This calculation gives y-butane = .78 and y-hexane = .22.

Therefore, the liquid recovered from the separation at 90 psia. is 60.5 mol per cent hexane and 39.5 mol per cent butane. This is the composition of material that will be fed to the separator of the second stage at 60 psia. At this latter condition calculation of Equation 1 in Engineering Fundamentals No. 384 shows x-butane = 0.214 and x-hexane = 0.770. The composition of vapor existing at these conditions is y-hexane = 0.4 and y-butane = 0.6.

The amount of liquid found at the end of the single-stage separation was zero. That found at the end of the two-stage separation is computed by use of a material balance.

Assume that one mol of material was the starting amount. Then the total hexane present was 0.4 mols and total butane present was 0.6 mols. If V_1 is the total number of mols separated as vapor, in the first stage, $1 - V_1$ is the total number of mols separated as liquid in the first stage. Using the mol fractions calculated above, the number of mols of butane in the vapor and liquid in the first stage are respectively .78 V_1 and .395 $(1 - V_1)$. The sum of these must be the original amount of butane, thus

$$.78\,V_1 + .395\,(1 - V_1) = .6$$

from which V_1 is found to be .532, and L_1 is found to be .468.

Therefore, the liquid from the first separation is .185 mols butane and .283 mols hexane, a total of .468 mols, and the vapor from the first separation is .415 mols butane and .117 mols hexane, a total of .532 mols.

To determine the amount of liquid recovered in the second separation one proceeds in the same manner. Let V_2 and $(.468 - V_2)$ be the mols of vapor and liquid separated. Then the mols of butane separated in vapor and liquid are, respectively, $0.6\,V_2$ and $0.214\,(.468 - V_2)$. The sum of these quantities must again be equal to the total mols of butane, thus

$$.185 = 0.6\,V_2 + 0.214\,(.468 - V_2)$$

which can be solved to give V_2 = .22 mols vapor. This leaves .244 mols of liquid recovered in the liquid phase, of which .054 mols are butane and .19 mols are hexane.

To summarize, by the single-stage reduction from above 121 to 60 psia. no liquid can be recovered, but by a reduction in two stages, first to 90, then to 60 psia., a total of .244 mols of liquid can be recovered per mol of starting material. Diagrammatically, the path of separation and compositions are shown in Fig. 1. One proceeds in a similar fashion to calculate the effect of multiple separations or separation when many components are present in the mixture.

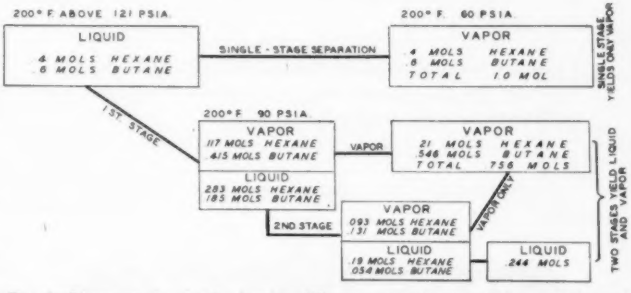

Fig. 1—Diagrammatic sketch showing difference in ultimate yield on single and two-stage separation

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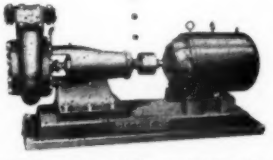

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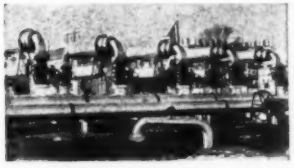
IT'S NEW CHECK IT

by Dan B. Miller

(1) FLAME ARRESTOR - PRESSURE - VACUUM VENT VALVE COMBINATION. The danger of flash-back fire in atmospheric storage tanks can be materially lessened by this compact safety device. It combines the patented VVH pressure - vacuum vent valve with a flame - arrestor bank which acts to prevent propagation of flame into storage tanks containing volatile and costly liquids. Flame - arrestor bank fits into throat of VVH pressure-vacuum vent valve and becomes an integral part of the valve body. The arrestor bank, of rolled aluminum construction, can be removed for cleaning or replacement. Rubber-to-metal sealing makes the valve tight and prevents it from freezing shut. *Black, Sivalls & Bryson, Inc.*

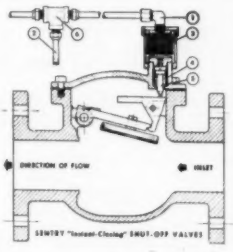
IT'S NEW CHECK IT

(2) DRY GAS-SCRUBBING METHOD based on centrifugal precipitation of solids and liquids, this gas scrubber is available in a variety of sizes up to 100,000,000 standard cubic feet per day. The vertical design scrubbers are used where either liquids or solids are to be removed from gas. Horizontal units, illustrated, are used primarily to remove liquids such as water and distillates. Outstanding features are: indiscriminate removal of entrained liquids and dust; its small size; ease of installation due to light weight and piping simplicity; not subject to overload, because of the operating principle involved. *Thermix Corp.*



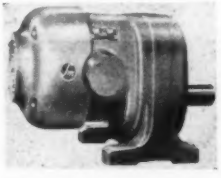
IT'S NEW CHECK IT

(3) SENTRY "INSTANT-CLOSING" SHUTOFF VALVE will close all gas, fuel-oil, or other "hot" lines entering a danger area. A small tube in which a nominal pressure is maintained is connected to valve and carried to any part of plant. Self-operating valve mechanism functions to automatically close valve whenever seal on control line is broken. As many control joints as desired, of one or several types, may be placed in a single line to operate one or any number of valves concurrently. The companion valve for "Instant - Opening" automatically provides a deluge of water at full line capacity, directed to any critical area requiring instantaneous flooding. It is adapted to other applications, such as automatic dumping of tanks and pressure vessels, full pressure feed for steam and fog, or CO_2 fire-smothering systems. *McRae Valve Corp.*



IT'S NEW CHECK IT

(4) SLO-SPEED "KLOSD-TITE" MOTOR, TYPE FWFB, is totally enclosed and includes such outstanding features as labyrinth seals, liberal heavy-duty ball bearings lubricated for life, and the patented Herringbone rotor, with motor and gears combined in a balanced design from power intake to drive shaft. Can be mounted in any position without modification. This new type geared motor is of "Klosed-Tite" construction for atmospheres containing nonexplosive dusts, vapors, and injurious foreign materials. An external fan forces blasts of air over the streamlined case. *Sterling Electric Motors, Inc.*



IT'S NEW CHECK IT

(5) FLUID-MOTOR OPERATOR FOR VALVES. This new design makes possible extensive use of motor-operated valves, since the actuating unit can be easily adapted to standard valves in stock or to valves already installed. The device can be operated by water, oil, or

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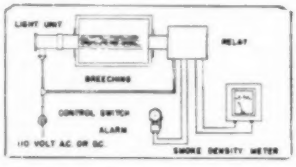
compressed air or gases. Motor unit, comprising the motor, gear box, and yoke, is bolted to the valve bonnet; and the motor operates the valve stem through the gear box. By means of a suitable control, the operating fluid can be admitted through either of two entrance ports, controlling the direction of operation of the motor for opening and closing the valve. When the valve gate reaches the end of its travel in either direction, the motor merely stalls, still under pressure. *Crane Co.*

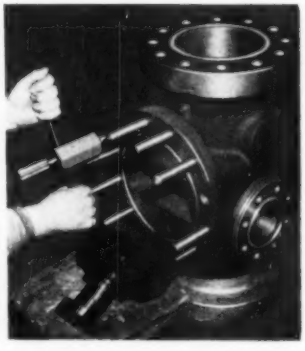
IT'S NEW CHECK IT

(6) IMPROVED SMOKE INDICATOR. Designed for boiler service, it is a heavy-duty unit with an easy-to-read density meter, an oversize light beam and flush panel construction. It is compact, easy to install and to service. Four-inch lens is readily removed for cleaning. Recorder can be added at any time. Unit is designed for use with steam jets or over the fire blower. It can be used on a 15-ft. span of breeching. Indicator system registers density of smoke, and alarm is warning that plant is losing efficiency. *Trimount Instrument Co.*



IT'S NEW CHECK IT

(7) CLEANOUT TAP and die for slush pumps and blowout-preventer studs. Although this tap and die is hardened, it is designed for cleaning up smashed threads and removal of rust and dirt. It is not intended for chasing new threads. It consists of three parts; the tap, the handles, and the die. Tap and handles may be separated from the die. Available in diameter sizes from ⅝ to 2 in. *Baird Manufacturing Co.*



IT'S NEW CHECK IT

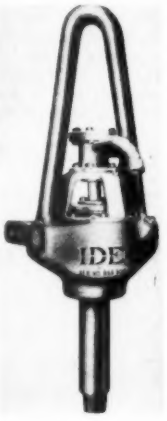
(8) HIGH-TEMPERATURE INSULATION PRODUCTS. A mineral wool all-purpose block, for temperatures to 1,700° F., called BL-17, has a density of 1.67 lb. per board foot. It is chemically inert, and does not disintegrate or cause rust or corrosion. C-18, a companion product, is an insulating cement composed of mineral wool, long-fiber asbestos, and an adhesive binder. It is applied like a plastic; 100 lb. of C-18 will cover 50 to 55 board-feet. The product is effective to 1,800° F, and contains a special inhibitor to prevent rust and corrosion. Others in the line are an insulating cement good to 2,300° F., finishing cement, pipe covering, mineral-wool blankets, loose fibrous and granulated mineral wool, protective coatings for insulation surfaces, and an insulation block adhesive. *Bigelow-Liptak Corp.*

IT'S NEW CHECK IT

(9) FLEETFONE, a highly selective two-way mobile communication system for operation in the 30-50-megacycle portion of the frequency spectrum, is designed for public utilities, transportation, and the petroleum industry. Radio transmitter-receiver is completely contained in a single metal-shielded unit of "sandwich" type construction, permitting mounting equipment in practically any position, on either a horizontal or a vertical surface. The controls and loud speaker are combined in a single compact unit for attachment under dashboard. *RCA Engineering Products Dept.*

IT'S NEW CHECK IT

(10) TANDEM BEARING SWIVEL. Two main bearings, placed in tandem, share the load equally, giving this swivel nearly double normal life and operating capacity. Both bearings are lubricated by an ample supply of cool oil which is force circulated by swivel rotation. The swivel is equipped with the Ideco Floating Washpipe assembly and the quick-change Nonpariel packing cartridge. This packing is a ready-to-use, quick-change packing, requiring only 22 minutes for replacement. Swivel body is a strong, light-weight, one-piece, steel casting designed to transmit the entire load to the tandem main bearing. *International Derrick & Equipment Co.*



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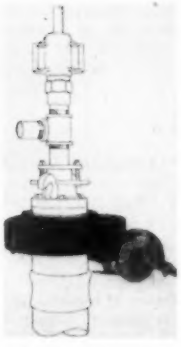


(11) MEXIA TUBING ROTATOR prevents premature split tubing and multiplies tubing life. Rotation speed is approximately one revolution every 15 to 20 hours. The Rotator fits any casing head and is installed between the usual casing head and the tubing packer, without requiring alteration of these parts. Ball-bearing movement is accomplished by means of a pawl-and-ratchet mechanism, actuated by normal operation of walking beam. *Mexia Tubing Rotator Co.*

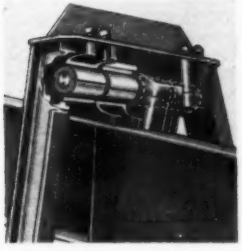
IT'S NEW CHECK IT

(12) AMBU-LIFT is designed for automobiles or emergency stations in oil fields, at plants, construction sites, and at any other installation where an emergency, col-

lapsible, automobile litter may be required. Important features are: easily assembled, 60 seconds; light weight, 10 lb.; compact stowage, knocked down to 8 by 28 by 20 in.; high strength; two sizes, adult and children; easily loaded, two persons needed; fits any sedan or two-door car; locks in place; handy carrying case; and removable, replaceable covering. *Aeronca Aircraft Corp.*

IT'S NEW CHECK IT

(13) CABOT EQUALASTIC EVENER BEARING consists of four special rubber cylinders vulcanized on a shaft.



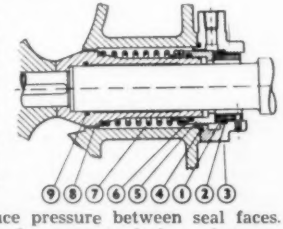
All angular motion between the pitman and the beam is taken within rubber bearings. This simple but extremely effective rubber bearing eliminates 62 parts, provides a shock absorber between polished rod and prime mover, requires absolutely no lubrication and is resistant to salt water, grease, and grit. The Equalastic bearing also reduces wear and maintenance on the other components of the pumping unit. The new bearing is now available on all sizes of Cabot pumping units. *Jones & Laughlin Supply Co.*

IT'S NEW CHECK IT

(14) PRESSURE-OPERATED RELIEF VALVE utilizing line pressure to open and close the main plunger and featuring high relieving capacity and precision control of blowdown, two new pressure-relief valves, designated as the Garrett type A shown and type B, are now available in all standard sizes for any specified working pressures. Type A is recommended for use on crude and product lines where long blowdown is usually desirable. Type B, which provides somewhat greater precision in blowdown control, is intended for operation in refineries, processing plants, and other systems where utmost accuracy is required in control of gases, liquids, and vapors. This valve is designed for operating temperatures up to 750° F. *Sales Engineering Co. of Houston, Inc.*

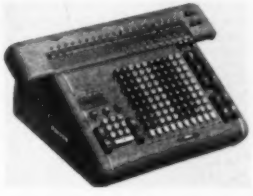
IT'S NEW CHECK IT

(15) FLEXIBOX MECHANICAL SEAL. Use of this seal does not necessitate any modification to the standard pumps; special sleeve (8) replaces conventional shaft sleeve, and cover (3) replaces usual gland. Rotary seal ring (5) is partially balanced in order to reduce pressure between seal faces. Static seal (6) effectively prevents leakage between sleeve and rotary seal ring without restraining freedom of rotary seal ring. Unique feature is patented spring drive. Spring (7) has specially designed ends which are an interference fit both on the shaft sleeve and also on the neck of the rotary seal ring. Stationary seal ring (1) is resiliently supported by cushion (2) and is positively prevented from rotating. *Flexibox, Ltd.*



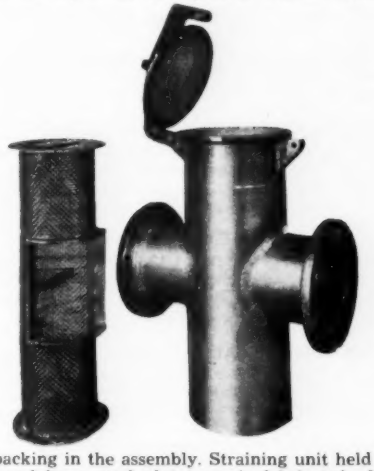
IT'S NEW CHECK IT

(16) FULLY AUTOMATIC CALCULATOR possesses a score of new features. It offers automatic multiplication, division, addition, and subtraction. Operating features facilitate handling of payrolls, invoices, inventories, and tax compilations, computing not only individual extensions, but also final results. All figure-work problems are handled, from elementary to the most complicated, with simplicity and ease. Excelling not only as a time and labor saver, it offers remarkable capacity for sustained accurate, high-speed figure-work production. *Friden Calculating Machine Co., Inc.*



IT'S NEW CHECK IT

(17) NEW PUMP SUCTION STRAINER consists of a steel barrel 13¾ in. o.d., 36 in. long, with inlet and outlet of proportionate size required. A flanged rim is provided at the top of the barrel, fitted with an O-ring, the only packing in the assembly. Straining unit held within the barrel by a steel plate cap, is fabricated of heavy woven steel cloth, fitted with a solid steel bottom, a flanged top with a lifting bar, and a close-fitting rigidly framed opening on the suction side. Effective screening area of the straining unit is eight times greater than the area of a 10-in. suction line; 12 times greater than 8-in. line. Inlets and outlets can be furnished for 6, 8, or 10-in. suctions. Any specified connection can be furnished on inlet or outlet. *S & R Tool & Supply Co.*



TRADE LITERATURE

(18) TESTING AND CONTROL EQUIPMENT FOR WATER ANALYSES illustrates and describes a complete line of apparatus and test sets especially designed for industrial water testing. *W. H. & L. D. Betz.*

(19) PRODUCTS, PLANTS, FACILITIES, AND SERVICES. This 16-page condensed catalog describes the construction features of 58 process vessels manufactured for the processing and producing divisions of the petroleum industry, including heaters, heat exchangers, condensers, evaporators, coolers, boilers, and preheaters. *Condenser Service & Enginering Co., Inc.*

(20) AIR-POWERED EQUIPMENT FOR OIL-WELL DRILLING covers a complete line of equipment specially suitable for use on oil-well drilling rigs. It illustrates and describes all sizes and types of air compressors, hoists, cranking motors, air tools, centrifugal pumps, and diesel engines. *Ingersoll-Rand.*

(21) HYDROPNEUMATIC TANK CALCULATOR. This calculator (based on Boyle's Law) tells instantly the best air water ratio, the most efficient pressure differential, the exact amount withdrawn on any pressure drop and the resultant reserve. *Automatic Control Co.*

(22) DRILL HOLES .002 IN. IN DIAMETER covers the features of two precision drills for extremely small perforations and lists all specifications and engineering data. It also describes the universal dividing head for use with these drills. *Taylor Dynamometer & Machine Co.*

(23) MERIAM INSTRUMENTS, a condensed catalog gives complete data on well-type and U-type manometers, mercury pressure gages, draft gages, flow meters, tank liquid-level gages, sight-feed bubblers, and line traps. Prices are included. *Meriam Instrument Co.*

(24) HALF-WAY 'ROUND THE WORLD is the story of a flight from New York City to Port Moresby, Papua, New Guinea, made in a twin-engine Beechcraft, between October 11 and December 4, 1947, by James Herrick and Wolfgang Langewiesche. *Cardwell Manufacturing Co.*

(25) BELLOWS-TYPE EXPANSION JOINTS is a tabulation of all engineering data and dimensions and includes sectional drawings and halftone illustrations of a complete line of expansion joints, anchor joints, offset joints, swing joints, and turbo joints. *Cook Electric Co.*

(26) PARTS LIST FOR MILITARY TRUCKS. This 12-page catalog is a parts price list for trucks built for the United States Armed Forces but now in industrial service. *Wm. O. Hensley.*

(27) GEOPHYSICAL CABLES. Easy-to-read, illustrated, 16-page brochure gives information on standard geophysical cables which can be made to specific lengths. Included are attachments and several types of takeouts. Covered are magnetometer, marine gravity, floating cables, and vinyl jacket land cables. *Vector Manufacturing Co.*

(28) OBI PRODUCTS is a new eight-page catalog giving complete information on Black Magic, White Magic (new oil emulsion mud), chemicals, weighting materials, OB mud guns, OB hand cleaner, and several new mud-conditioning products. *Oil Base, Inc.*

(29) PARKER CATALOG NO. 203. Design data, specifications, materials, and general dimensional data are listed for each of four types of Parker tube fittings for hydraulic and fluid-handling systems. Each fitting shape is illustrated by both drawing and photo, and dimensions are tabulated for the entire size range. Tubing and tube-fabricating equipment including flaring tools, hand and production tube benders, and tube cutters. *Parker Appliance Co.*

(30) SPIRAL-SET DIAMOND CORE BITS is a four-page, two-color folder containing descriptions of the unique techniques used in the manufacture of the bit and a comprehensive cutaway illustration of the new diamond core barrel. *Core Laboratories, Inc.*

(31) MUD AND MUD SERVICE, a 12-page, multicolored booklet describes, in detail, the complete line of drilling muds and mud service. Each mud product is illustrated, its properties are given, and its suggested applications noted. Mud-testing instruments and test kits are also illustrated and described. *Magnet Cove Barium Corp.*

(32) BIT AND TOOL CATALOG. Printed in three colors, the 24-page booklet is fully illustrated and provides complete information on the firm's full line of products, with special parts and accessories list included for convenience. Special cutaway photos and engineering drawings are provided in addition to closeup photos of many of the products. *A-1 Bit & Tool Co.*

(33) 1950 CATALOG covers a complete line of drilling and production control equipment for deep, high-pressure wells. The 40-page book is printed in two colors and is fully illustrated, employing job photos, closeups, cutaways, and cross-sectional drawings. *Oil Center Tool Co.*

(34) AGITATED GAS ABSORBERS, a paper by Kenneth S. Valentine, discusses the processes for which gas-absorption apparatus of the mechanical agitator type are best suited, and includes drawings of gas-absorption systems with detailed examples of the reactions for which they can successfully be used. *Patterson Foundry & Machine Co.*

(35) NEW CONDENSATE DRAINAGE CONTROL. A new 24-page publication comprises six pages of a technical discussion on high-pressure, high-temperature condensate return, followed by specifications, case history, flow diagrams, and details of installation. *Cochrane Corp.*

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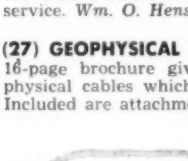

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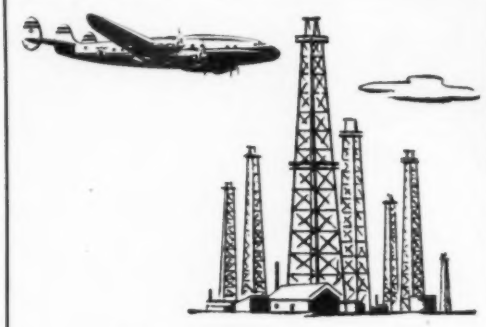

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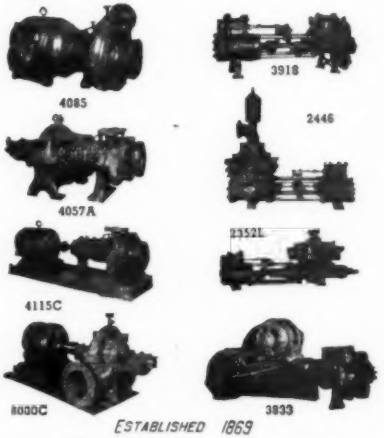

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PIPE LINES

Great Lakes Line Will Extend to Irvington, Neb.

FURTHER enlargement of Great Lakes Pipe Line Co. system capacity by installation of a 165-mile, 12-in. line from Irvington, Neb., to Sioux Falls, S. D.; expansion of four delivery terminals and two pump stations; and construction of a new pump station, all on its northwest line from Kansas City to Grand Forks, N. D., was announced last week by Harry Moreland, president. Estimated cost of the project is $7,900,000.

Terminals to be enlarged are at Sioux City, Iowa; Sioux Falls; Alexandria, Minn.; and Fargo, N. D. Pump stations will be expanded at Irvington and Sioux City, and a new station will be built at Pipestone, Minn.

This latest move will extend a recently authorized 12-in. line from Kansas City to Irvington, a pump station located outside Omaha, which was part of a $37,500,000 program announced in August by the company. At that time it was revealed a 12-in. line would be laid along existing routes from Ponca City and Tulsa, Okla., through Kansas City, Kans., Des Moines and Mason City, Iowa, to Minneapolis, and from Kansas City to Omaha; and a 45-mile, 8-in. line from Cushing through Drumright to Tulsa. Twelve pump stations and six delivery terminals will be enlarged in this program on which construction began last week.

Work on the line from Irvington north and the terminal and station expansion will be carried on as part of a total project. Laying of the line to Omaha is scheduled for the early part of this winter, while grading for expansion of terminal facilities at Omaha will start within a few days.

Refined petroleum products are now pumped northwest from Kansas City through an 8-in. line to delivery points at Omaha, Sioux City, Sioux Falls, and Alexandria, and from there to Fargo and Grand Forks through a 6-in. line. Products also are pumped through a 6-in. line on this part of the system from Marshall, Minn., to a terminal at Watertown, S. D.

Capacity north of Sioux Falls will be increased by the new station at Pipestone, midway between Sioux Falls and Marshall, and by operation of an existing station at Willmar, Minn., between Marshall and Alexandria.

When completed, enlargement of the northwest leg of the system will provide connected Oklahoma and Kansas refiners with capacity to transport by pipe line all the gasoline and distillate they manufacture for the area served by these Great Lakes terminals. The new capacity will make it possible to build up larger stocks of distillate in summer in advance of the heating season, and in winter and spring additional gasoline can be moved so that sufficient supply will be on hand when the heavy demand caused by spring farming operations arrives. Larger lines also mean that current movements of products can more nearly keep pace with withdrawals from terminals in times of heavy demand.

Cradling 26-in. pipe with three tractors of Latex Construction Co. for dope-gang operations in the construction of a section in Arkansas for Texas Gas Transmission Corp.'s Carthage, Tex.-Middletown, Ohio, project

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This latest move brings to 1,141 the miles of line to be laid, 1,096 of it 12-in., in the pipe-line company's expansion program, and total expenditures authorized to $45,400,000.

At the time of the private sale of $55,000,000 of 20-year sinking-fund debentures this summer, the company said the money had been obtained as the result of a study which showed it was necessary for connected refiner-shippers to transport by other methods a considerable volume of their products into territory served by Great Lakes. As expansion of refineries is completed the volume available for movement will become increasingly larger. Larger line capacity also will permit the company to discontinue operation of economical temporary pump stations.

Construction of the 12-in. line between Oklahoma and Minneapolis was begun at Minneapolis recently, but because of the steel strike with the resultant shutdown of pipe-rolling mills, scheduled completion dates on the various sections may be moved back. Grading and other preliminary work will be started at several terminals soon, but at most of them actual construction will be delayed because of lack of steel.

In the meanwhile, continual traffic studies will be examined to determine further system needs, Moreland said.

Sohio Builds 38-Mile Toledo-Fostoria Line

Construction of a 38-mile, 8-in. products pipe line from Toledo to Fostoria, Ohio, will be started this week according to an announcement by S. H. Elliott, vice president of Standard Oil Co. (Ohio).

The new Sohio line, to be used for products such as gasoline, kerosine, and fuel oils, will cost $700,000. Construction has been contracted by Britton Construction Co., which is now operating from Hamilton, Ohio.

Connecting Sohio facilities in the two cities, the new line will be parallel to the company's present 6-in. line. Completion is scheduled for early in December of this yer.

Sohio already has right-of-way for this second pipe line and also has the necessary pipe for the construction of the new line. It now operates 332 miles of petroleum-product pipe line in Ohio. The new link will thus add more than 10 per cent to this mileage.

It will make it possible to transport petroleum products in both directions without reversals and will connect at Fostoria with other lines now laid out of Fostoria to Tiffin, Lima, and Cleveland.

Pipe Laying Completed For Argentine Gas Line

Operations for the laying of 10-in. pipe for the Comodoro Rivadavia-

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Buenos Aires natural-gas pipe line were completed September 17 by Direccion General del Gas del Estado (Argentina Government Gas Service Department) headed by Julio V. Canessa, president of this organization as well as president of Yacimientos Petroliferos Fiscales. This is the first long gas line built in South America. It is the longest pipe line of any kind in South America and the longest 10-in. line for any purpose in the world.

Construction of a compressor station at the Comodoro Rivadavia end of the system is being pushed. After the line has been tested, it will be dedicated at a national holiday which will be proclaimed for the occasion.

In reviewing this undertaking built under his direction, Canessa mentioned the final length as 962 miles. Materials used in construction, he said, include: 63,500 tons of steel; 90 tons of electrodes; 45,500 gal. asphalt coating; 8,000 tons of special asphalt coating; 1,800,000 sq. yd. of glass mat and 2,000,000 sq. yd. of impregnated paper. Cost of the line is stated as 150,000,000 pesos ($30,000,000).

While waiting for delivery of pipe from Manessma, a firm at Dalvia, Italy, pipe rolled locally in Argentina was utilized. The northern end was laid by crews of Direccion del Gas del Estado; the southern end by Compania Technica International.

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Tennessee Gas Transmission Planning Carthage Outlet

Tennessee Gas Transmission Co. has asked Federal Power Commission to authorize the construction of additional natural-gas facilities designed to carry from the Carthage gas field in Panola County, Texas, through its own Carthage transmission line to the company's main gas-transmission line approximately 111,000,000 cu. ft. of gas per day being transported for Tennessee by United Gas Pipe Line Co. through the latter company's Carthage line.

The proposed construction program includes installation of 4,800 hp. in new units at Tennessee's station No. 5 in Natchitoches Parish, Louisiana, which is at the eastern terminus of Tennessee's Carthage line; and construction of about 24.2 miles of 30-in. line looping a portion of the company's main gas-transmission pipe line between compressor stations No. 5 and No. 6 in Louisiana.

Tennessee estimates that the additional facilities will increase capacity of the Carthage line by approximately 50,000,000 cu. ft. per day, making a total of 250,000,000 cu. ft., and will increase capacity of the main line between the two compressor stations sufficiently to transport the additional 111,000,000 cu. ft. per day.

Over-all cost of the new facilities is estimated at approximately $2,924,930. Tennessee proposes to finance the construction out of funds on hand and funds resulting from operations.

Tennessee said the application is necessarily conditioned upon its reaching an agreement with United for the cancellation of the contract of March 15, 1945, under which United transports the 111,000,000 cu. ft. of gas for Tennessee.

Tierra del Fuego Line Approaches Completion

Completion of Chile's first crude-oil pipe line is expected in November. This project is the 45-mile, 8-in. line from Cerro Manantiales (Spring Hill) oil field to port facilities at Caleta Clarencia on an island in Tierra del Fuego.

Construction is being handled by Compania Tecnica International (Techint). The project was designed by Williams Brothers Co.

Panola Lays Bolivar Outlet

Panola Pipe Line Co., a subsidiary of H. L. Hunt, is laying a 12-mile, 3-in. crude-oil line from the Bolivar field, Denton County, Texas, to the pipe-line system of Sinclair Refining Co.

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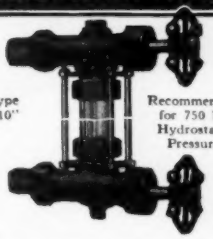

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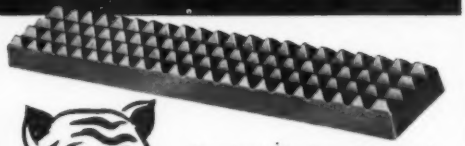

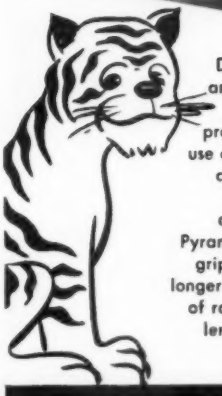

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NATURAL GAS

Hope Natural Seeking to Boost Wholesale Gas Rates

Hope Natural Gas Co. has asked Federal Power Commission to approve an increase in wholesale natural-gas rates, which would amount to approximately $2,098,215 annually based on anticipated sales for the year ending October 31, 1950. The rates, according to FPC, would become effective on November 1.

The proposed rate increase would be distributed among five of the company's wholesale purchasers in Cleveland, Akron, and Canton, Ohio; Pittsburgh, Pa.; and Syracuse, Rochester, and Buffalo, N. Y. Gas rates to the East Ohio Gas Co. would be increased to $1,437,975; Peoples Natural Gas Co. would pay $240,280 more; New York Natural Gas Corp., $188,570 more; Manufacturers Light & Heat Co., $230,640 additional; and Mount Morris Gas Co. (Pennsylvania) $750 more.

Hope Natural told FPC that present rates, which are based on 1946 operations, are inadequate because there was a substantial increase in costs of operating during 1947 and 1948, and revenues fell below a reasonable amount.

The situation grew critical in 1948, the company said, as a result of substantial declines in the market price of byproducts, such as butane, propane, and gasoline.

Aboveground Storage of Natural Gas Now in Use

Initial operation began last week in Warren, Pa., of a new-type storage facility for natural gas which uses a solid fireproof adsorbent material within an aboveground container.

C. V. Spangler of J. F. Pritchard & Co., Pittsburgh, which developed the process, said that this is the first pilot plant to be created for the testing on an entirely new method for the storing of natural gas. *(An engineering article explaining the operation appeared in The Oil and Gas Journal, May 5, 1949, on page 94.)*

Spangler reports that in this pilot plant the methane stored on the granular adsorbent "fullers earth" will not flow away as a liquid nor escape readily as a gas. He said that the fuel stored in this manner will be difficult to ignite.

Gas storage, or some method of handling the demand for peak-load gas in cold weather, is becoming a critical problem for many gas companies, particularly those just beginning to buy and distribute natural gas. Since underground storage is frequently not available to them, gas-storage plants or special plants to make peak-load gas may be needed.

Storage on adsorbents is being developed as a safe method to meet this need. Storage plants provide a place to put off-peak gas as contrasted to peak-load plants that make gas from other materials. Since the stored gas is the same gas as that distributed, there are no interchangeability problems involved. Plants using adsorbents for storage would present no more than ordinary gas-plant operating hazards, Spangler said.

Present plans call for a thorough testing of this storage method with the pilot plant which was placed in operation last week and which is being operated by the Pritchard company in conjunction with the Floridin Co., of Warren, Pa. A demonstration run is planned which may be witnessed by interested gas company engineers.

Gas-Company Operating Revenues Increase 8.9%

Operating revenues of natural-gas companies reporting to Federal Power Commission totaled $61,325,709 in July, or an increase of 8.9 per cent over the $56,309,247 reported for the same month a year ago. This follows a general trend, and compares with an increase of 8.6 per cent in June *(The Oil and Gas Journal, September 8, 1949, page 109)*.

Gas-utility operating income for July 1949, amounted to $5,518,822, down 20 per cent from the $6,898,093 reported for July 1948. Net income for the month was $5,299,423 compared to $7,419,964 reported in July 1948.

Gas-operating revenue deductions amounted to $55,815,320, an increase of 12.9 per cent. Of this total, operating expenses accounted for $43,298,852, up 18.5 per cent; depreciation for $6,915,698, a gain of 9.2 per cent; and taxes for $5,600,770, a decrease of 14.6 per cent.

Gas sales to ultimate consumers in July 1949, were 109,418,000,000 cu. ft., an increase of 3.2 per cent over July 1948. Sales to residential consumers decreased 0.5 per cent while sales to commercial and industrial consumers increased 2 per cent and 3.3 per cent, respectively. Revenues from sales to ultimate consumers increased 3.6 per cent and amounted to $27,862,568. Revenues from the three classes of service, residential, commercial, and industrial, increased 1.4 per cent, 2.9 per cent, and 5.2 per cent, respectively.

FPC Approves Natural-Gas Line for Jersey Central

Jersey Central Power & Light Co., Asbury Park, N. J., has received Federal Power Commission authorization to construct a 39.4-mile natural-gas pipe line in New Jersey connecting the company's Coast Division system with Texas Eastern Transmission Corp.'s Big Inch line. Estimated overall cost of the project is $1,208,200.

The 10-in. line will connect with Texas Eastern's system near Bound Brook, N. J., and extend southeasterly to Jersey Central's gas-manufacturing plant in Long Branch, N. J. Natural gas received from Texas Eastern will be mixed with manufactured gas at the Long Branch plant for distribution in Monmouth and Ocean counties.

Texas Eastern previously was ordered by FPC to deliver up to 5,000,000 cu. ft. of natural gas per day to Jersey Central, which now distributes only manufactured gas in Cape May, Ocean, Monmouth, and Morris counties. The gas-service areas in Cape May and Morris counties will continue to be supplied entirely with manufactured gas, the company said.

Natural Gasoline

Socony-Vacuum Builds New L.P.G.-Handling Plant

Socony-Vacuum Oil Co., Inc., is constructing a new plant for handling and filling cylinders of bottled gas at Burlington, Vt., which will permit speedier service and improved distribution of the company's liquefied-petroleum gas service to rural and other consumers in the Vermont and New Hampshire areas.

Previously the filled cylinders were shipped into the areas from manufacturing plants in New Jersey and Maine.

Firms Seek Plant Permit

AUSTIN. — North American Oil Consolidated and Ungren & Frazier et al have applied to the Texas Railroad Commission for permission to install a gasoline plant and gas-injection facilities for the King and Swastika sands in the Bartlett field, Jones County, Texas. The operators propose to use gas injection initially, and then supplement the program by water injection, if necessary. Hearing on the application will be held in this city October 18.

cure • prevent *pipe-line quivers with* FLUOR Pulsation Dampeners

Fluor pulsation dampeners were installed as original equipment on the 1200-mile natural gas line from West Texas to Southern California. This view in a main line station at Tucson, Arizona shows Fluor pulsation dampeners on both the suction and discharge sides of the compressors. These dampeners are paying for themselves by permitting the required gas flow to be maintained with minimum horsepower.

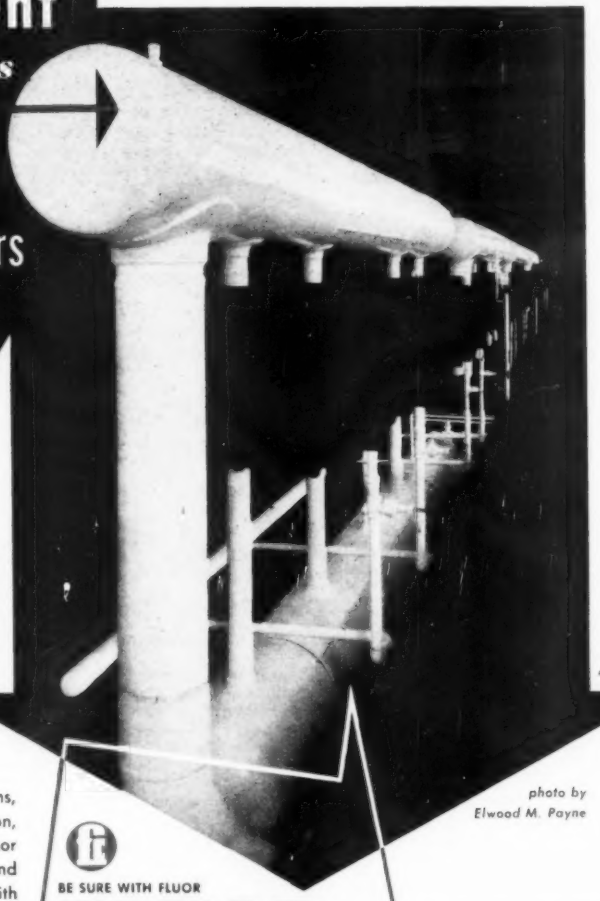

photo by Elwood M. Payne

Pipe vibration from gas-compressor pulses costs money—in repairs, in power consumption, and in meter inaccuracy. It can also cost Human Life.

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2 prevent

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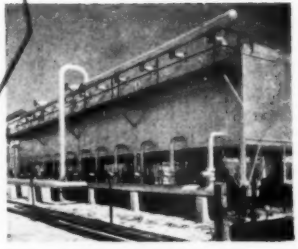

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Fluor air-cooled heat exchangers are more economical where make-up water is expensive, where water has bad scaling characteristics, and where the temperature of liquid to be cooled is relatively high. (Manufactured and sold by Fluor and Griscom-Russell Co.)

REFINING

Cit-Con's Lake Charles Lube Plant Completed

CIT-CON OIL CORP., jointly owned subsidiary of Cities Service Co. and Continental Oil Co., has announced completion of its new 6,000 bbl. per day lubricating-oil refinery at Lake Charles, La.

F. M. Simpson, vice president and general manager of the company, reported that the unit was completed October 1 by the contractors, Lummus Co. and Max B. Miller & Co., Inc.

The modern refinery was designed exclusively for manufacture of lubricating-oil base stocks and wax products. The plant site is situated on a 360-acre site adjacent to Cities Service Refining Corp.'s plant near Lake Charles.

Designed for production of 6,000 bbl. per day of high-quality 95-v.i. lubricating oil, provisions have also been made for production of 100-v.i. oils, and special design features and equipment were provided for production of fully refined crystalline wax to meet requirements for such uses as coating of milk containers, food packages, and various other paper products.

Cities Service Refining Corp.'s nearby plant will pump reduced-crude charging stock from its topping stills to the new lube-oil refinery. Gas oil, solvent-plant extracts, and various wax byproducts will be returned to the Cities Service refinery for cracking or fuel-oil use. Louisiana, Arkansas, and East Texas crude oil is being used for lube-oil production.

(A complete engineering article on construction of the plant appeared in *The Oil and Gas Journal, March 24, 1949, on page 198.)*

Shell to Use Jet Plane for Testing of Various Fuels

Shell Oil Co. has acquired a jet-equipped airplane from the U. S. Air Force, and will use it to test various types of fuels, both conventional and jet.

The firm thus becomes the first oil company to use a jet-equipped research plane. The plane, now being fitted with analytical and recording instruments, is a B-26-type bomber equipped with both twin reciprocating engines and the jet-engine unit.

J. H. Doolittle, Shell vice president, reported that the plane represents "a new step forward in the jet research we have been conducting for several years." He added that previously this work had been confined to the company's jet laboratory at Wood River, Ill., but it "is extremely difficult and prohibitively expensive to reproduce on the ground the wide range of operating conditions encountered in actual flight."

Test equipment being installed in the plane will provide detailed information on the performance of fuels and lubricants in both types of engines. A complexity of thermocouples is employed to measure, in flight, cylinder temperatures of the oil and fuel systems. An engine analyzer with a screen like that on a radar set enables technicians to study the performance of each individual cylinder. An oil-flow measuring device constantly records the quantity of oil circulating through the engine, and another instrument checks the volume of blow-by gases in the crank case as an indication of the performance of the lubricating oil in the region of the pistons, rings, and cylinders.

Instrument panel on Shell Oil Co.'s jet-equipped plane which will be used to test various types of fuels. The plane is also equipped with two reciprocating engines in the wings, and jet engine is specially mounted in the fuselage. Analytical and recording instruments in the cockpit permit tests during actual flight of fuels and lubricants for both types of engines. Note engine-analyzer oscilloscope with controls mounted below, at far right

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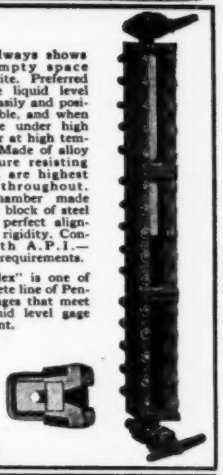

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West German Refineries Are Increasing Production

Production at West German oil refineries is increasing sharply, according to reports received from Frankfurt. Second-quarter output this year was 169 per cent over the same quarter in 1948, and crude-oil imports have risen while petroleum-product imports have fallen off.

Refinery runs during the second quarter averaged 35,000 bbl. daily compared with only 13,000 bbl. daily the same period in 1948.

Imports of crude for the first half of the year averaged 17,500 bbl. daily, four times greater than those in the first half of 1948; however, imports of gasoline averaged 5,350 bbl. daily in the 1949 period compared to 9,850 bbl. the year previously.

Local refining is the least expensive way to meet West German petroleum needs, Allied occupation authorities have concluded, and have planned certain refinery-expansion projects including the addition of more cracking facilities.

Program Completed for Galveston A.I.Ch.E. Meet

A program featuring varied topics of interest for members has been planned for the fourth annual technical meeting of the South Texas Section, American Institute of Chemical Engineers, to be held at Hotel Galvez in Galveston October 21.

Included will be papers on hydrocarbon processing, corrosion problems, and multicomponent distillation.

Final Plans Made for New York's A.I.Ch.E. Meeting

Final program arrangements have been completed for the third annual fall symposium of the New York Section, American Institute of Chemical Engineers, November 17. Various water problems of the process industries will be discussed, including substitution of air or seawater for surface water-cooling towers, water treatment to reduce sealing, applications of compression distillation, and an overall survey of the economics of supplying water to the plant.

The meeting will convene at Hotel Statler.

Frontier Refining Co. to Build New Coking Unit

Frontier Refining Co. has announced that it will construct a new two-coil integral coking unit with a capacity rating of 2,400 bbl. daily at its Cheyenne, Wyo., refinery.

Harry A. Brown, refinery superintendent, reported that construction is scheduled to begin in the first half of 1950.

The refinery at present has a capacity of 11,000 bbl. crude-oil charge per day.

Lube-Oil Shipments Show Decline in Mid-Continent

Western Petroleum Refiners Association reported last week that production and shipment of lubricating oils continued to decline in the Mid-Continent area in August.

The association's figures, which are based on operations of 13 reporting companies, showed total August production of 1,086,961 bbl., 19.4 per cent below the same month a year ago. Total shipments in the month amounted to 1,267,321 bbl., of which 1,210,713 bbl. was domestic and 56,608 bbl. export.

Total shipments declined 83,731 bbl., or 6.1 per cent. Domestic shipments were 5.2 per cent below a year ago, while shipments to export were 30.9 per cent above August of last year.

On-hand stocks at the end of the month totaled 1,389,719 bbl., representing a decrease of 18.9 per cent from the end of August 1948.

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4.

CONVERSION OF PETROLEUM 2nd Edition 1948 by A. N. Sachanen.

This book sets forth in detail both the chemical and technological aspects of all the important conversion processes, with special emphasis on the use of modern catalytic cracking and other processes for manufacturing motor and aviation fuel. Sections are also devoted to new developments in hydrogenation, isomerization, thermal cracking, and the manufacture of gasolines and related products. Together with the text are given a large number of tables of properties and performance characteristics of the various products discussed; charts, graphs, and diagrams of plant equipment are also included **$11.00**

5.

PETROLEUM REFINERY ENGINEERING—1949 by W. L. Nelson.

The third edition of a basic text in petroleum refinery engineering incorporating changes in the field brought about by the Second World War. The new material consists mainly of three types: new and revised physical data; practical detail on plant operation; and new processes, products, and operations. In addition to the new material, many new figures, tables and examples are presented to aid the reader in understanding the subject **$9.00**

6.

PETROLEUM PRODUCTION ENGINEERING—Vol. 1 Development by Lester C. Uren.

Presents a thorough practical treatment of all steps up to the point at which the wells are ready to produce. After a fairly brief treatment of oil properties and occurrence, and oil exploration, the author describes in considerable detail general factors of developing the field, problems, methods, and equipment of drilling, casing, finishing the well, oil field hydrology, etc., with particular emphasis on improved methods of deep well drilling **$7.00**

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This Book List, (partial), is to assist Journal readers in keeping up-to-date, their files and technical libraries. Included here are some of the latest editions of reference text books in the fields of drilling, production, natural gasoline manufacture, refining, and transportation subjects.

The Oil and Gas Journal, from time to time, will publish additional lists of technical editions. Inquiries and book shipments will be promptly handled.

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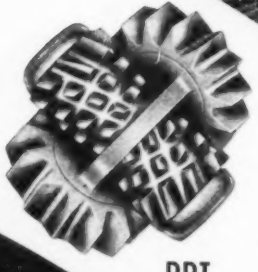

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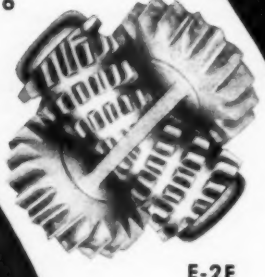

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Among the Drilling Contractors

Upturn Taken in Number Of Operating Rotary Rigs

Drilling activity in the United States and western Canada took an upward turn during the week ended October 3 (latest report) with 46 more rotary rigs operating than during the previous week. The increase brought the total number of active rigs to 2,036, greatest number since the week ending August 22, when the same number was reported. It interrupted an almost steady decline in activity which brought the number of operating rigs during the week ended September 29 to the lowest level since the latter part of January. Increases in number of rigs running were made in all areas except the Gulf Coast, Pacific Coast and western Canada.

ROTARY RIGS IN OPERATION*
(United States and Western Canada)

Area—	Week ended 10-3-49	Change week ended 9-26-49	Change week ended 10-4-48
Gulf Coast	500	—10	— 99
W. Tex.-N. M.	580	+19	— 26
Ark.-N. La.-E. Tex.	159	+ 8	— 22
Oklahoma	232	+10	— 67
Kansas	127	+ 5	— 16
Illinois-Eastern	121	+21	— 37
Rocky Mountains	108	+ 3	— 56
Pacific Coast	146	— 6	— 31
Total United States	1,973	+46	—354
Western Canada	63	— 2	+ 15
Total	2,036	+46	—339

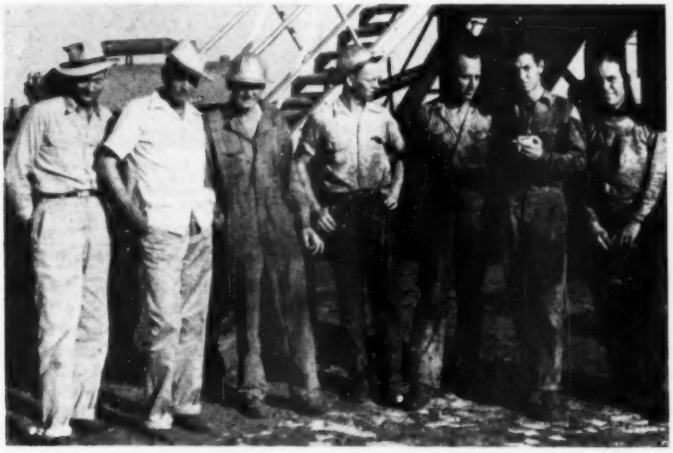
*Courtesy Hughes Tool Co.

George Puckett, Wewoka, Okla., is drilling for Davidor and Davidor at their 1 Wheeler, NW NE NW 30-5n-8e, a half-mile south extension test for the Allen pool in Pontotoc County, Oklahoma.

Milton Crowe, Inc., Shreveport, is starting a Travis Peak wildcat test for J. F. Magale and associates at 1 J. H. Walker, 14-17s-13w, Bossier Parish, Northwest Louisiana. The location is about 4 miles south of the recently discovered Bossier City Pettit lime field.

Sun Drilling Co., Ardmore, Okla., is the contractor and joint operator with Gilmer Oil Co. on a projected 4,500-ft. Arbuckle lime test being drilled 2 miles east of Ryan, Jefferson County, South Oklahoma. The test is on their Dilley lease in 12-6s-7w.

Commonwealth Drilling Co., Calgary, has started drilling at 1 South Smoky Lake, wildcat test for the Barnsdall-Honolulu-Seaboard group in northeastern Alberta Province, Canada. Location is in LSD 8, 32-58-18w4.



Taking time out at one of Parker Drilling Co.'s rigs operating for Shell Oil Co. in the Elk City field, Beckham County, Oklahoma, are, left to right: Harold Hickman, toolpusher; O. J. Johnson, Houston Oil Field Material Co., Inc.; James Floyd, driller; Travis Arney, Tom Hall, "Zip" Hall and Owen Devine, crew members; and "Blackie" McGee, welder

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J. D. Ferrell Drilling Co., Inc. Great Bend, Kans.

History: This company, as it now exists, is a comparative newcomer to the drilling contractor field, beginning operation in 1946. At that time, operations were carried on with two rigs. Since its beginning one more rig has been added, all equipment having medium depth ratings.

J. D. FERRELL

Ferrell also owns all trucks and other machinery necessary for moving the drilling equipment from location to location. He also recently purchased his own plane.

In addition to drilling activity the company owns production in western Kansas in the Great Bend area. Five wells are owned outright by the company, and interests are held in 16 others.

Personnel: J. D. Ferrell, active in the oil business in Kansas since 1935, owns nearly all stock in the company, and acts as its president and manager. Charles E. Drake is production superintendent and Floyd Smith is drilling superintendent. J. W. Railsback is office manager in Great Bend.

Sidelights: Tools of this company drilled the well which opened the Silver Bell pool in Stafford County, Kansas, in May 1949. The Rous well which opened the Palacki Arbuckle pool in Ellsworth County in February this year also was drilled by Ferrell's equipment.

Earl F. Wakefield Drilling Co., Wichita, an active Kansas contractor, now has a rig operating in western Canada where a wildcat test, 1½ miles south of production in the Leduc field, Central Alberta Province, is being started for Oil City Petroleum, Ltd.

Wright, Clark & Senkel, Graham, Tex., are drilling T. D. Humphrey 1 Bevel, wildcat Strawn test in the J. Wilson Survey, 5 miles west of Weinert, Haskell County, North Texas.

Glasscock Drilling Co., Shreveport, has started drilling for Nebo Oil Co. at 1 LaSalle Land Co., a wildcat in 15-15-4e, Ouachita Parish, north Louisiana.

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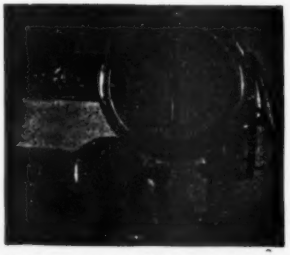

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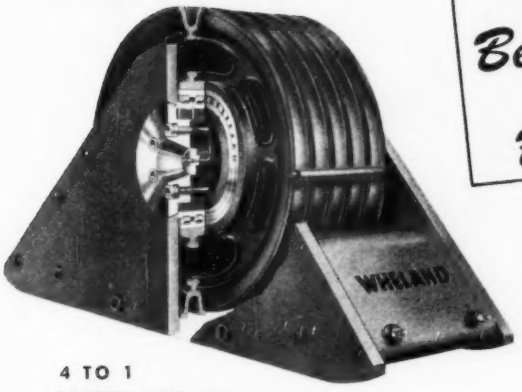

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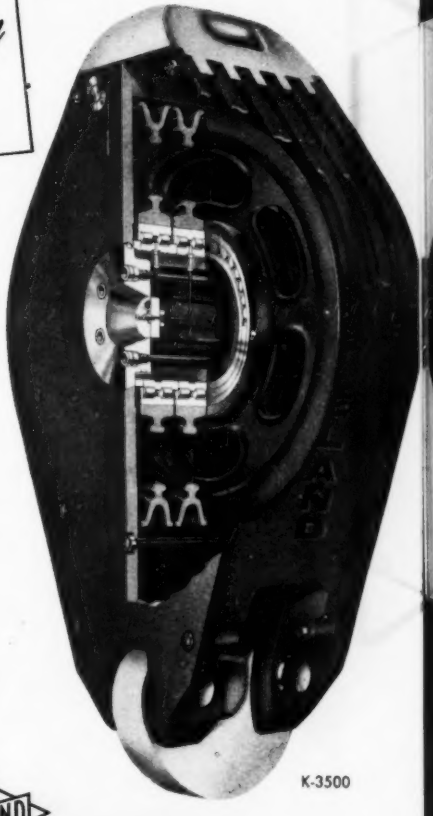

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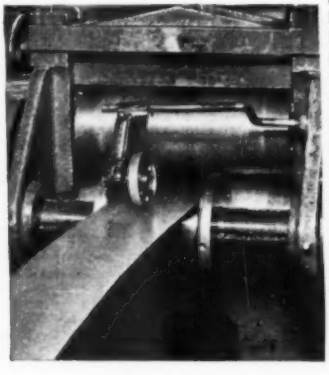

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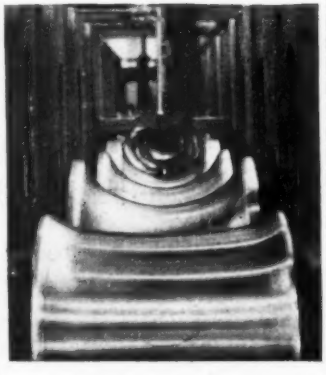

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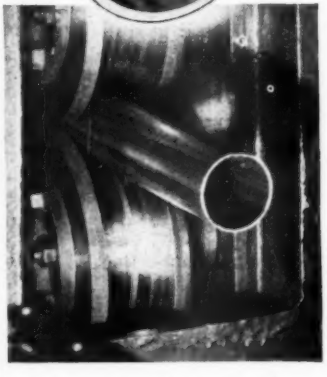

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Exploration and Drilling

Shaping Next Year's Drilling Program

IN the larger oil companies, right now the first steps are being taken that will result a little later in a tentative 1950 drilling budget. Each district office is having conferences both informal and formal on the land and geological aspects of everything in its district. The regional offices are having preliminary general looks at how their 1949 budgets are going to wind up, and tentatively figuring in total terms, about how much they can expect to get to divide up for 1950. Top management probably already has a rough forecast of income and outgo, including capital requirements, for 1950.

What happens is a little like the irresistible force meeting the immovable object. When top management takes a look at total cash probably available in 1950, it makes a tentative allotment for land and exploration plus another allotment for development drilling. Over all, that makes up pretty much an immovable object. Any exploration and drilling program that comes up to the top as a result of the series of local recommendations, must be fitted inside the limits of total cash available.

But that isn't all of the story of the immovable object. Out of the total cash available for exploration and drilling, certain fixed expenses have to be deducted. Salaries, equipment, and supplies for land, geological, and particularly geophysical personnel must come out. Then comes the big item of rentals. That takes another big bite out of the cash available.

How does the irresistible force build up? Each district office builds up a list of "must" wells that have to be drilled in 1950. In some cases these are offset requirements; in some cases an important block must be tested before leases expire; in some cases a test must be drilled to confirm or reject a geological theory about a large area, where the total lease rentals add up to substantial sums. On some blocks there are contract agreements calling for a well by 1950. Then each district has one or more pet wildcats that it believes are "hot" prospects.

At each step in the series of conferences moving from the bottom up, the irresistible force loses just a shade of its momentum; a certain number of wells are not quite sensitive musts; they can be deferred a bit longer if obsolutely necessary. On the other hand, by the time a regional program has been worked out for presentation, the regional executives have decided in favor of a total drilling program that exceeds their tentative cash allotment for 1950. They are prepared to insist that their cash allotment just must be increased by top management. Quite often they can make a case that top management can't deny. So the immovable object of cash allotted, gives a little.

Even at this early stage it is apparent that for most of the larger companies, the recommended minimum 1950 drilling program will exceed any amount of cash that top management can afford to allot. A big exploration play generates a certain amount of momentum after a couple of years that will be reflected in drilling requirements for several years after the drive behind the exploration program slackens. Now we have had an exploration program that has been accelerating steadily from the end of the war. If it has reached a peak, or slowed down, the slowing did not start any earlier than the spring of 1949. Every big company will continue to feel the effect of that exploration drive in its drilling requirements for 2 or 3 years to come.

Well, how do the big companies close the gap between must drilling and not enough cash? By farmouts. It is claimed that most of the larger companies have been giving steadily better farmouts for several months, and that over a year's time the improvement in class of prospect, and terms, is quite noticeable. Most independents and most brokers will flatly deny this. The answer, so it is claimed, is that the good farmouts are deep, expensive, blue-chip deals. By farming out one good prospect that would require a 10,000 to 13,000-ft. test, the big company can drill two or three medium or shallow prospects.

But these blue-chip farmouts are not for the average independent; he can't handle them. However, there are certain large independents, generally producers only, who have the cash, and whose tax position makes a deep wildcat farmout deal look reasonable. These independents are getting better and better prospects offered to them, and are taking some of them. *Charles J. Deegan.*

HIGHLIGHTS OF WEEK'S DEVELOPMENTS

WEST TEXAS.—Additional Strawn production on the southeast side of North Snyder field, Scurry County, was in prospect at Sunray Oil Corp. 1 Sentell, Tract 2, Section 26, J. P. Smith Survey, although definite identification had not been reported. A drill-stem test at 7,382-7,448 ft. had gas in 3 minutes and oil in 15, flowing to pits at the rate of 25 bbl. of oil hourly. Recovery was 1,700 ft. of 38°-gravity oil. When pipe was pulled after a 5-hour test at 7,448-7,508 ft., the well unloaded oil after the fifth stand, and was still heading while the remainder was being pulled.

NORTH TEXAS.—New Bend conglomerate production between Hildreth and Lewis-Stewart conglomerate fields, but separated from both by dry holes, was indicated at The Texas Co. 1 H. E. Haws, W. H. Morrow Survey. A drill-stem test recovered 1,054 ft. of clean oil at 6,252-58 ft. Length of test was not disclosed. Location is a north offset to a 6,556-ft. failure drilled by Russell Maguire.

ROCKY MOUNTAIN AREA.—Several excellent completions have been made extending the Fiddler Creek area westward toward Hay Creek, Weston County, Wyoming, in recent weeks. Some of the wells have had completion gages as high as 130 bbl. of oil per hour from the Newcastle sand. Shows have been rumored on the Continental Oil Co.-Pure Oil Co. stratigraphic test in Burleigh County, North Dakota, but these are without confirmation.

KANSAS

Three New Areas Opened In Fairport Pool Vicinity

THREE new producing areas are being opened in the vicinity of the Fairport pool in Russell and Ellis counties. Anschuts Drilling Co. 1 Eulert, NW NW SE 35-11-15, 3 miles east of the pool in Russell County, swabbed 90 bbl. of clean oil in 2 hours in initial test in Arbuckle lime at 3,314-19 ft. (—1,453-58 ft.). Swab was run to depth of 1,900 ft. off bottom.

About 7 miles to the southeast of the Anschuts well and about 5 miles east of the elongated Fairport pool, Crown Oil Co. 1 Foster, SE SE NE 29-12-14, swabbed 350 bbl. of oil in a 24-hour test in Lansing lime at 2,841-53 ft. Top of the Lansing is 2,804 ft. with casing 40 ft. in. Pay zone was given a 3,500-gal. acid treatment. The well is about 1½ miles west of the small Claussen pool.

E. H. Adair 1 Froelich, SW SE SE 27-12-16, 2 miles west of the Fairport pool, in Ellis County, swabbed 15 bbl. of oil per hour in 8 hours from Arbuckle lime at 3,541-43 ft. It is about 2½ miles south of the Blue Hill pool. Surface elevation is 2,070 ft.

In Rooks County, Heathman Drilling Co. has established a new pool at its 2 Nutsch, SW SW SW 3-10-20, completed with a potential rating of 1,867 bbl. per day from Arbuckle topped at 3,824 ft. (—1,580 ft.). Total depth is 3,832 ft., plugged back from 3,834 ft. The discovery is 1 mile northwest of the Marcotte pool, 1 mile southeast of the Palco pool, and about 3 miles west of the prolific Berland and North Berland pools.

Three miles south of the Berland pool, in Ellis County, Derby Oil Co. and Nate Appleman have established another new producing area at their 1-A Warner, NW NW NE 12-11-20, which pumped 390 bbl. net oil, with about 16 per cent water, on potential test. Pay is the Lansing lime, topped at 3,409 ft. (—1,265 ft.), with casing perforated at 3,458-65 ft.

J. M. Huber Corp. 1 Sims, NW NW NW 9-19-6, northeastern Rice County, has been completed on the pump for 33 bbl. of oil and 3 bbl. of water per day, and opens the Little River pool. Production is from the Lansing, topped at 2,737 ft. (1,108 ft.), and in which casing was perforated at 3,069-75 ft. It is 6 miles northwest of the Smyres pool and about 2 miles south of the recently completed discovery well of the Odessa pool. The well had been drilled by Finston & Co. and Murfin Drilling Co. to the Arbuckle, and then taken over by the present operators.

KANSAS SUCCESSFUL WILDCATS

Greenwood County: E. E. Kilby 3 Lock, NE NW NW 3-24s-13e, pumped 30 bbl. of oil per day from Mississippian at 1,638-77 ft., TD .

Stafford County: Fred Anschutz 1 Smith, NW NW SW 24-22s-14w, pumped 250 bbl. of oil per day from Arbuckle at 3,798-3,805 ft., anhydrite 805 ft., Heebner 3,200 ft., Toronto 3,316 ft., Lansing 3,447 ft., Viola 3,711 ft., Simpson 3,740 ft., TD 3,805 ft.

KANSAS WILDCAT FAILURES

Barber County: Russell Maguire 1 E. DeGeer, NE NE NE 4-33s-15w, dry, TD 5,306 ft., lime 4,234 ft., Mississippian 4,818 ft., Viola 4,991 ft., Simpson 5,129 ft., Simpson sand 5,136 ft., Arbuckle 5,249 ft.

Coffey County: C. C. Whittaker 1 Coffman, NE SE SE 17-22s-14e, dry, TD 1,845 ft., Mississippi dolomite 1,824 ft.

Greenwood County: J. H. Hershey estate 1 Smethers, SE SE NW 10-27s-8e, dry, TD 2,645 ft., Bartlesville 2,540 ft., Mississippi lime 2,620 ft.

Morris County: Hutchinson Oil & Gas Co. 1 Martin, SW NW NE 14-17s-5e, dry, TD 2,226 ft., Kansas City 1,668 ft., Mississippian 2,177 ft.

Nemaha County: The Texas Co. 1 Murdock, SE SE SW 16-2s-13e, dry, TD 846 ft., lime 538 ft., sand 790 ft., granite 838 ft.

Pottawatomie County: Westgate-Greenland Oil Co. 1 Pessemier, NE NE NE 23-9s-11e, dry, TD 3,270 ft., Topeka 755 ft., Oread 1,054 ft., lime 1,290 ft., Kansas City 1,420 ft., basal Kansas City 1,642 ft., Mississippian 2,37 ft., Kinderhook 2,535 ft., Maquoketa 3,191 ft., Viola 3,244 ft.

Wabaunsee County: Thrifty Drilling Co. 1 Strowig, SE SW SW 3-12s-11e, dry, TD 3,383 ft., lime 1,360 ft., Kansas City 1,496 ft., basal Kansas City 1,712 ft., Mississippian 2,450 ft., Kinderhook 2,670 ft., Hunton 2,876 ft., Maquoketa 3,090 ft., Viola 3,160 ft., Simpson 3,297 ft., Arbuckle 3,363 ft.

Plains Exploration and Sterling Drilling Co. 1 Schwanke, SW SW SE 27-13s-10e, dry, TD 3,290 ft., Topeka 932 ft., lime 1,524 ft., Kansas City 1,670 ft., basal Kansas City 1,888 ft., Mississippian 2,566 ft., Kinderhook 2,880 ft., Hunton 3,047 ft., Maquoketa 3,195 ft., Viola 3,283 ft.

MISSISSIPPI

Jones County Prospect Logs Sharp Fault

JACKSON.—Red Wing Drilling Co. 1 Torry Smith, wildcat approximately 6 miles north of Laurel, Jones County, flowed an unestimated amount of gas, condensate, and salt water through ¼-in. choke on drill-stem test at 5,505-40 ft., with 1,600 psi. tubing pressure. The salt water did not clear up, so operators pulled tubing and squeezed perforations. Schlumberger log of this prospective discovery indicates a fault at 4,565 ft. with approximately 625 ft. of section cut out. The lower part of the Midway and upper part of the chalk are missing. Log also revealed a sand section at 5,444-63 ft. in the second City Bank formation which was not cored or tested, and indicated approximately 25 ft. net sand in the zone perforated at 5,505-40 ft.

The biggest producer to date in Bude field, Franklin County, has been completed by The California Co. Its 1 J. W. Bass unit flowed 604 bbl. of 43.8°-gravity oil daily through a 7/32-in. choke with tubing pressure of 1,750 psi. Completion was made from perforations opposite the lower Tuscaloosa sand at 10,948-70 ft.

In Green County, 2 miles south and 1 mile east of the Sand Hill discovery well, Don Reese et al 2 I. R. Anderson, 23-4n-8w, encountered top of the Wilcox at 2,360 ft. Structurally this point is approximately 88 ft. lower than same operator's 1 I. R. Anderson, 22-4n-8w, located 1 mile west of the second well. The low structural position of the sand is encouraging to the operators as it is hoped that faulting will be encountered in the chalk section. Operator is drilling below 3,501 ft.

The last available gage taken on Stanolind Oil & Gas Co.'s 1 J. B. Dockery, discovery well for Russum field, Jefferson County, was 50 bbl. of oil on pump with trace of salt water.

At Rodney field, Jefferson County, the discovery well, Danciger Oil & Refining Co. 1 Mrs. Kate Logan, is still shut in and no completion gage is available.

MISSISSIPPI WILDCAT FAILURE

Carroll County: H. Barksdale Brown & Co. 1 Mrs. Riesie Gee, 2-17n-3e, dry, TD 3,581 ft.

FLORIDA WILDCAT FAILURES

Lafayette County: Gulf Refining Co. 1 Brooks Scanlon, Inc., 36-5s-10e, dry, TD 4,512 ft.

Monroe County: Coastal Petroleum Co. 1 State of Florida, 32-62s-38e, dry, TD 7,559 ft.

CALIFORNIA

Court's Space Decision Opens Placerita Boom

LOS ANGELES.—The recent court decision which declared California's space requirements law unconstitutional has thrown Placerita field wide open. At least 12 rigs are now active in the area with a possible 4 more due. Fourteen new locations have been set since the court decision.

The best indications as to ultimate production, place recoverable oil at about 240 bbl. per acre-foot. Sand thickness runs around 250 ft. At the present time there are 68 completed wells in this field with production averaging better than 500 bbl. per day per well. If the present drilling rate continues there will be better than one well per acre about November 1.

Four new wells were completed in the field this week for a total new production of 3,150 bbl. daily. There were also two abandonments which point up the northern limits of production. Serago Oil Co. 1 Yeager Comm., 30-4n-15w, was dry at 3,338 ft. and definitely across the north bounding fault. Rothschild Oil Co. found its 1 Pleasant Comm., 31-4n-15w, right on the fault and dry at 1,742 ft.

At Kern Bluff, National Steel & Shipbuilding Corp. may return to its 1 National-State, 30-29s-29e, and deepen. This dry test is now bottomed at 2,050 ft. It topped the "S" zone at 1,847 ft. "T" at 1,895 ft., and Santa Margarita at 2,018 ft.

Humble Oil & Refining Co. is drilling ahead with its wildcat southeast of Paloma field. It has passed 7,600 ft. but will drill to 12,000 ft. or better, to touch known producing zones in this area.

In Trico gas field, Kern County, Natural Gas Corp. is preparing to enter and redrill 1 Heath, 13-24s-22e. This well was originally completed by Standard Oil in August 1946, but was shut in.

One of two semiwildcats in the Raisin City area has given a slight southerly extension to that field. Coast Exploration Co. and Von Glahn after redrilling brought in 71 Ripperdan for 200 bbl. of 24.5°-gravity oil per day. Water cut runs very high. Location of the well, bottomed at 5,300 ft., is 24-15s-17e. To the south, British-American Oil Producing Co. may complete its 33-10 K.R.D. this week. Total depth is 6,375 ft., with gun perforations at 4,990-93 ft. Intervals at 6,060-66 ft. and 5,050-46 ft. tested wet. Kreyenhagen was topped at 5,895 ft. and Kreyenhagen "E" at 6,113 ft. Location of the test is 10-15s-17e and if successful will extend Raisin City field to the northwest.

In spite of the order of the City Council curtailing production in Wilmington field, drilling continues at a rapid rate. Twenty-four locations were set this week. Long Beach Oil Development Co. accounted for 14, Leo E. Olinger for 8 and Union Pacific Railroad and Continental Consolidated Corp. 1 each.

Union Oil Co.'s test in Washington, the 3 State, near Oceanside, has been swabbed without result in the interval 7,398-9,032 ft., following completion of water shut-off at 7,240 ft. Tests will continue with higher intervals being included in the tests. Total depth is 9,344 ft.

CALIFORNIA SUCCESSFUL WILDCAT

Kern County, Tejon area: Rose L. Bright 1 Bright, 34-11n-19w, new zone in Tejon field, Santa Margarita 2,775 ft., unnamed sand 3,886 ft., Reserve 4,485 ft., gun perf. 4,489-4,538 ft., flowed 290 bbl. of 270°-gravity oil per day through 16/64-in. bean, and 500 bbl. per day through 21-64-in. bean, TD 4,542 ft., elev. 966 ft.

CALIFORNIA WILDCAT FAILURES

Kern County, Antelope Hills area: Independent Exploration Co. 1 Williamson,

27-27s-19e, Point of Rocks 2,870 ft., dry, TD 3,066 ft., elev. 905 ft.

Comanche Point area: Henry Lubking & Associates 3 Lubkind, 36-32s-29e, dry, granite 2,790 ft., TD 2,831 ft., elev. 763 ft.

Morton & Sons 2 Macoil, 32-12n-18w, dry, TD 624 ft., elev. 878 ft.

Round Mountain area: Pacific Supply Coop. 1 KCL, 13-28s-28e, dry, Vedder 2,333 ft., TD 2,337 ft., elev. 1,217 ft.

Orange County, Fairview area: Independent Exploration Co. 1 Irvine, 23-6s-10w, dry, TD 1,376 ft., elev. 102 ft.

Tulare County, East Trico area: Trico Oil & Gas Co. 28-1, 28-24s-24e, dry, Mya 2,536 ft., Mya sand 2,543 ft., TD 4,047 ft., elev. 230 ft.

Ventura County, East Piru area: Jergins Oil Co. 1 Larinan, 24-4n-18w, dry, TD 6,712 ft., elev. unknown.

Fillmore area: C. W. Colgrove 46-18 Bursin, 18-4n-19w, dry, TD 3,678 ft., elev. 900 ft.

SOUTHWEST TEXAS

Possible Gas Discovery Waits for Outlet

CORPUS CHRISTI.—J. W. Gorman 1 Ferguson-State, wildcat test in Duval County, has shut down for orders at 2,027½ ft., after recovering gas on several drill-stem tests, to see if they have an outlet for gas. If a gas connection cannot be obtained, the operators are going to drill deeper to test for oil, and if no oil sand is found, they will plug back and complete in the gas sand. The last drill-stem test from 2,023-25½ ft. flowed gas with 290 psi. working pressure and recovered 30 ft. of oil-cut mud. The well is located in the BS&F Survey 104, approximately 16 miles northeast of Freer.

Gasoline Production Corp., Ralph Rowden, and Dale H. Rowden 1 John P. Akin, State of Texas, has been put on pump after swabbing 200 bbl. of oil per day through perforations at 2,154-65 ft. in the Dougherty sand. The test is located in the F. E. Stearns Survey 184, approximately 11½ miles southwest of Freer, Duval County.

Quintana Petroleum Co. is planning a test in the Sheriff 9,100-ft. sand field, Calhoun County. The well is the 3 John Boyd, 350 ft. from the southeast line and 675 ft. from the southwest line of a 78.75-acre lease in B. Rodriquez Survey, 5 miles northwest of Port Lavaca.

The Chicago Corp. 1 George Renken, fourth test in West Corpus Christi field, Nueces County, flowed 118 bbl. of oil on potential test through 9/64-in. choke from 60 perforations at 9,060-70 ft. Tubing pressure was 800 psi. with casing sealed, gas-oil ratio 758-1, and gravity 36.2°.

SOUTHWEST TEXAS (DISTRICTS 1 AND 4) WILDCAT FAILURES

Duval County: Bridwell Oil Co. 1 F. Wied, Jose M. Ynojosa Gr., A-628, 5 mi. NE of Crestonia, dry, TD 6,011 ft.

Glen Brown 1 J. T. Dinn, CB&CNGRR Sur. 2, A-1809, approximately 1 mi. S of Schimmel, dry, TD 3,257 ft.

Hidalgo County: Continental Oil Co. 1 Henry Blom et al, Block 3, Sec. 13, Porcion 65, 2 mi. N of McAllen field, dry, TD 10,020 ft.

Jim Hogg County: Dulaney Oil Co. 4 Robert Holbein et al, Block 65, Las Animas Gr., 16 mi. S of Mirando City, dry, TD 2,135 ft.

Medina County: E. H. Keator 1 L. J. Schmidt, J. G. Durst Sur. 14, 1 mi. S of Ina field, dry, TD 2,015 ft.

Webb County: Morris Cannan 1 Reuben J. Beaman et al, 25 mi. NW of Freer, 4 mi. SW of Adami field, dry, TD 1,075 ft.

Williamson County: H. G. Dickinson 1 H. Ging, Rutersville College Sur., 1½ mi. SE of Coupland, dry, TD 1,270 ft.

PERMIAN BASIN

Upton County Wildcat Tests Distillate

MIDLAND.—Humble Oil & Refining Co. 1 Pembrook, Upton County wildcat about 5½ miles north of the Benedum area, located 660 ft. from north and 2,247 ft. from east lines, Block X, C. C. DeWitt Survey, reported its first shows in recovering 55°-gravity distillate on a drill-stem test at 12,268-12,341 ft., identified as Silurian.

Cores from 12,279-12,322 ft. recovered 43 ft. of lime with a trace of porosity. From 12,322-41 ft. the recovery was 19 ft. of lime and shale with a trace of porosity and oil stains. The 2½-hour drill-stem test followed, using 1,850 ft. of water blanket and ⅝-in. bottom-hole choke. The water blanket started flowing out in 16 minutes and gas appeared at the surface in 20 minutes. Distillate flowed at the surface in 90 minutes.

The flow was turned into tanks where it gaged 4 bbl. of distillate in 1 hour, with gas-oil ratio at 21,900 cu. ft. Recovery in the drill pipe was 90 ft. of distillate. Operators were to drill ahead to the Ellenburger.

Four miles southeast of the 1 Pembrook, Humble 1 Oswalt was drilling at 10,825 ft. Humble 1 Parrott, SE SE 3-Y-EL&RR, located ½ mile north of nearest production on the northwest side of Benedum field, hod total depth at 11,492 ft., and set 5-in. liner from 9,718-11,490 ft., for probable completion from the Fusselman. An earlier drill-stem test from 11,403-492 ft., open 3 hours, recovered 490 ft. of oil and gas-cut drilling mud.

Magnolia Petroleum Co. 1-36 Glass, southwest outpost to the Ellenburger discovery in Pegasus field, Midland and Upton counties, was the prospective third Ellenburger producer for the field when it flowed 49 bbl. of clean 53°-gravity oil on a drill-stem test from 12,723-73 ft. in 1½ hours. The test, in the top of the formation, had gas in 4 minutes, mud in 28 minutes and clean oil on the pits in 32 minutes. There was no formation water in the recovery. Open flowing bottom-hole pressure ranged from 1,670-1,515 psi., with shut-in pressure at 3,330 psi. in 15 minutes. It was to drill deeper. On an elevation of 2,885 ft., the well had top of the Ellenburger at 12,725 ft., which was reported some 200 ft. low to the field opener. According to observers, the 1-36 Glass is expected to find some 500 ft. of pay section above the water.

Borden County.—Sinclair Oil & Gas Co. was reported preparing to abandon its 1 Rosa Pratt, SE NE 44-32-T6N-EL&RR, 1-mile west stepout to its 1 Williams, Ellenburger discovery in the northwest corner of the county. The 1 Pratt had total depth at 10,070 ft. A 1-hour and 50-minute drill-stem test from 10,024-70 ft. recovered 3,800 ft. of salt water. A previous test from 9,872-9,972 ft., open 45 minutes, it recovered 500 ft. of water blanket, with no oil, gas or formation water. A similar recovery was had at 9,979-10,026 ft.

Sinclair 1 Ruth Reynolds, 1½ miles northwest of the Williams discovery in Section 33, recovered 540 ft. of water blanket and 20 ft. of free oil on a 1-hour and 50-minute test from 9,785-8,839 ft. A 1-hour test from 9,847-8,947 ft. recovered water blanket with no oil, gas or water. It was preparing to drill-stem test to total depth. The same company's 1 W. H. Bryan, north offset to the discovery, in Section 40, was preparing to drill-stem test at total depth of 9,990 ft. Cores from 9,831-9,940 ft. recovered lime with oil shows.

Scurry County.—Sunray Oil Corp. 1 Sentell, Tract 2, Dallas Trust & Savings Bank Subdivision, Block 1, J. P. Smith Survey, 2 miles east of nearest production on the southeast side of North Snyder field, was testing the Strawn of the Pennsylvanian after checking too low on the Canyon reef for production.

A drill-stem test of the Strawn at 7,382-7,448 ft. had gas in 3 minutes, mud in 8 minutes, and oil in the pits in 15 minutes. It was allowed to flow into pits for 9 minutes, through ½-in. choke, and was estimated to be making 25 bbl. of oil an hour. There was no formation water. Recovery in the drill pipe was 1,700 ft. of 38°-gravity oil and 50 ft. of drilling fluid. Operators ran electric survey and were to drill deeper and test.

Standard-Fryer Drilling Co., Dallas, 1 Wilkirson, link well between Kelly and North Snyder fields in Tract 24, Section 17, Block 1, J. P. Smith Survey, completed for 365 bbl. of oil in 12 hours, flowing through 32/64-in. choke, on tubing pressure of 300 psi.

North of production, Stanolind Oil & Gas Co. 1-A J. B. Whatley, 548-97-H&TC, prepared to drill ahead below 7,315 ft. after a 1-hour drill-stem test at 7,266-7,315 ft. recovered 360 ft. of salty mud. Top on the Canyon reef was 7,265 ft., with elevation of 2,572 ft.

Progress Petroleum Co. 1 E. S. Carden, 503-97-H&TC, 2½ miles southeast of Stanolind's Whatley test, was drilling ahead at 6,714 ft. in shale.

Hiawatha Oil & Gas Co. was reported moving in rotary for its 1 J. J. Schattel, wildcat located 6 miles east of North Snyder field, in the NW NW 90-2-H&TC. Location is about half way between the field and Norsworthy 1 Feldman, which at last report was out of the lime at 6,840 ft., and drilling ahead in shale at 6,885 ft.

WEST TEXAS (DISTRICTS 8 AND 7-C) SUCCESSFUL WILDCATS

Crockett County: The Texas Co. 1 Victor L. Pierce, 5-O-C. W. Brown Sur., 21½ mi. S and slightly E of Ozona, on potential flowed 4,400,000 cu. ft. of gas a day, ¾-in. choke on 2-in. casing set at 11,851 ft., TP 1,551-1,507 psi., top pay 11,715 ft., TD 11,969 ft., elev. 2,248 ft.

Runnels County: Texas Union Oil Corp. 1 Bradley, W. Holmes Sur. 100, NE offset to Pan American 1 Hugh Campbell, 5 mi. N Ballinger, flowed 5 bbl. of 45°-gravity oil a day, plus 520,000 cu. ft. of gas, perf. 4,008-23 ft., TD 4,038 ft.

Woods Drilling Co. 1 Carl Vogler, J. C. McKean Sur. 534, 6 mi. SE Winters, 2½ mi. W Freeman field, pumped 125 bbl. of 42°-gravity oil a day, Gunsight lime pay, top 2,349 ft., TD 2,366 ft., elev. 1,772 ft.

WEST TEAS (DISTRICTS 8 AND 7-C) WILDCAT FAILURES

Andrews County: C. U. Bay, Vickers Petroleum Co. et al 1-A David Fasken, 5-42-T2N-G&MMB&A Sur., 1¼ mi. SE Amerada 1-A University, dry, TD 4,777 ft., Yates 3,075 ft., pre-Cambrian 4,460 ft.

Ector County: Bayard Ewing 1 Augusta C. Barrow estate, 22-42-TX1S-T&P, 2½ mi. E or S end N. Cowden field, dry, TD 4,971 ft., anhydrite 2,010 ft., Yates 3,200 ft., elev. 3,015 ft.

Midland County: York & Harper, Inc., 1 TXL, TP Lands Trust, 25-39-T3S-T&P, 12½ mi. S Midland, dry, TD 4,445 ft., to skid rig 30 ft. south.

Pecos County: Rigo Petroleum Corp. 1 Morris Monroe, 40-1-I&GN, 6½ mi. N Sheffield, dry, TD 645 ft.

Schleicher County: George Parker and C. L. McCune 1 B. M. Boyd, Sec. 94, AB&M Sur., NE corner of county, dry, TD 4,980 ft., Strawn 4,380 ft., Ellenburger 4,896 ft., elev. 2,298 ft.

Sutton County: Theck & Cross Drilling Co. 1 S. E. McKnight, NE NE 78-9-TW&NG, 10 mi. NE Sonora, dry, TD 6,620 ft., Strawn 5,459 ft., Ellenburger 6,550 ft., elev. 2,392 ft.

SOUTHEASTERN NEW MEXICO

HOBBS.—Buffalo Oil Co. 3 Comanche Unit, Chaves County wildcat in 26-11s-26e, swabbed dry in 8 hours, then swabbed an estimated 3 bbl. of salt water hourly for 12 hours, with a slight show of gas and a trace of distillate. Retainer was set at 5,963 ft. and perforations squeezed from 5,938-41 ft. Plugged-back depth was 5,951 ft.

In Eddy County, 10 miles southwest of

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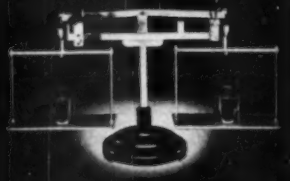

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HOUSTON

Malaga, Humble Oil & Refining Co. 1 Wiggs, 31-24s-27e, drill-stem tested from 11,660-11,802 ft. and 11,792-11,891 ft., then drilled ahead below 11,899 ft. The test was open 1 hour and 45 minutes, during which gas showed in 20 minutes and recovery was 71 ft. of gas-cut mud. The second test, of the same length, recovered 125 ft. of drilling mud with no shows.

Gulf Oil Corp. 1 Maud Saunders, 34-14s-33e, was drilling below 9,453 ft. Top on the Wolfcamp was 9,210 ft., by operators, on elevation of 4,207 ft.

The Texas Co. 1 Ertel, 27-16s-38e, approximately 2-mile northwest outpost to Knowles Devonian field, had total depth at 5,636 ft. and was coring ahead. Slight oil odor in dolomite was cored at 5,360-62 ft., and bleeding oil from pin-point porosity was cored at 5,362-68 ft. Four feet of recovery at 5,425-29 ft. had scattered staining in the bottom and the bottom foot from 5,531-41 ft. was dolomite bleeding oil.

Amerada Petroleum Corp. 1 Rose, SE NW 35-16s-38e, north offset to the Knowles discovery, flowed 139 bbl. of oil in 17 hours through ¾-in. choke, then gaged 430 bbl. of 46°-gravity oil in 24 hours, through ½-in. choke, from 144 perforations at 12,560-96 ft. following a 500-gal. treatment. Location of perforations on the first test was not reported.

SOUTHEAST NEW MEXICO WILDCAT FAILURES

Eddy County: R. W. Fair 1 Santa Fe, SW NW NW 22-19s-26e, RR right of way, 4 mi. S Dayton field, dry, TD 2,431 ft., elev. 3,324 ft., red sand 535 ft., San Andres 1,265 ft., bailed 3 to 5 bll. oil an hr. at 1,500-1,798 ft.

R. W. Fair 1 Thompson, 1,650 ft. from S and W Lines, 15-19s-26e, dry, TD 1,889 ft., elev. 331 ft., red sand 555 ft., San Andres 1,316 ft.

MICHIGAN

Rank Wildcat Area May Get Play

MOUNT PLEASANT.—A significant Traverse oil show was logged in Comstock Township, Kalamazoo County, this week, on William C. Vandenberg, Jr., 1 Reynolds, SE SE SW 5-2s-10w. Traverse lime was picked at 1,405 ft., with well showing 350 ft. of oil and 700 ft. of salt water in 4 hours from a porosity zone drilled at 1,429-34 ft. Operator was running 5-in. casing and planned to plug back before starting production tests. It was believed that oil and water come in together. This is one of the best Traverse shows, if not the best, logged in Kalamazoo County. The nearest oil pool is Bloomingdale Traverse field, Van Buren County, some 25 miles to the west and north.

This oil showing in Kalamazoo County was viewed as the possible stimulus needed to expand exploratory drilling in southwest Michigan into a new, almost totally unexplored area. It was indicated that at least two follow-up tests would be drilled in the area of the 1 Reynolds regardless of the outcome of that test.

O. H. O'Neal's 1 Winchester, SE NE NW 21-24n-10e, potential new Dundee oil discovery, Elmwood Township, Tuscola County, was deepened 2 ft. in the objective and acidized with 750 gal. On test after acidization, the well swabbed and flowed 150 bbl. of net oil in the first 18 hours. Flow was by heads and rods were being run to allow installation of a pumping unit for use in agitating the flow. Present total depth is 2,742 ft. Dundee top was logged at 2,557 ft. with pay showing at 2,735-42 ft. The hole filled 900 ft. with oil during the first 2 hours after drilling and a total of 30 bbl. of oil was recovered natural by swabbing before the acid was ordered. No water was showing. Final completion was being delayed awaiting reports of additional production tests.

O'Neal and Harry Leman, major acreage holders in the play, have agreed on a voluntary diagonal northwest-southeast 20-acre spacing pattern for the district. Each has staked one location for early drilling. O'Neal will drill the south offset, SE SE NW 21-14n-10e, while Leman will drill the east offset, SE NW NE 21-14n-10w.

MICHIGAN SUCCESSFUL WILDCAT

Genesee County, Forest Township: Clyde L. Palmer 1 Lanfear, NW SE NE 6-9n-8e, Berea 1,437 ft., 25 bbl. of oil after 40-qt. nitro shot, TD 1,459 ft.

MICHIGAN WILDCAT FAILURES

Cheboygan County, Ellis Township: Roosevelt Oil & Refining Corp. 1 Ormsbee.

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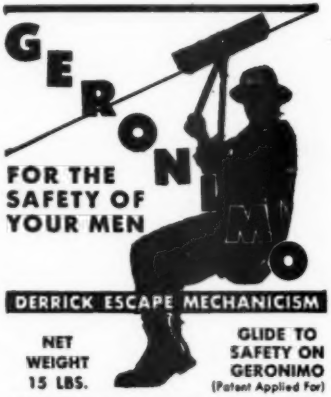

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NE NW NE 1-34n-2w, Trenton 4,442 ft., dry, TD 4,650 ft.

Barry County, Woodland Township: P. K. Degenther 1 Enness, SE NE SE 13-4n-7w, Traverse 2,140 ft., dry, TD 2,000 ft.

Bay County, Pinconning Township: Don Rayburn 1 Philip, SW SW SW 20-17n-4e, Dundee 2,903 ft., dry, TD 3,282 ft.

Monroe County, Frenchtown Township: Francis T. Canon 1 Compau, SW SW NE 12-6s-9e, Trenton 1,912 ft., dry, TD 2,910 ft.

Newaygo County, Sheridan Township: Mercer Oil Co., Inc., 1 Smith Comm., SW SW NE 6-12n-14w, Dundee 2,556 ft., dry in Monroe, TD 2,607 ft.

Ottawa County, Robinson Township: Basin Oil Co. 2 Martinia, NW NW SW 36-7n-15w, Traverse 1,644 ft., dry, TD 1,660 ft.

Davidor & Davidor 1 Wheeler, NW NE SW 30-5n-8e, south extension test for the Allen pool, Pontotoc County, recovered 110 ft. of free oil and 10 ft. of oil-cut mud in a 30-minute drill-stem test of Upper Gilcrease sand at 2,314-30 ft., but is drilling ahead. The same operators apparently have an extension southward for the South Wetumka pool in Hughes County at their 2 Newlin, SW NW SW 34-9n-10e, which got 105 ft. of free oil and 15 ft. of oil-cut mud in a drill-stem test of basal Cromwell sand at 3,137-53 ft. Casing has been run.

OKLAHOMA SUCCESSFUL WILDCATS

Caddo County: Cleary & Smith 1 Young, SW NW NW 36-5n-12w, 50,000 cu. ft. of gas per day from sand at 241-54 ft., TD.

Gravin County: New pay in E. Lindsay field—Bauman & Pray 1 Hinkle, C NW SW 6-4n-3w, flowed 200 bbl. of 35°-gravity oil per day from Oil Creek sand at 11,034-64 ft., 10/64-in. choke, TD 11,-163 ft., old well drilled deeper.

Noble County: New pay in Polo field—Anderson-Prichard 1 Ellwood "A," SE SE SW 26-22n-2w, flowed 272 bbl. of distillate plus 54,500,000 cu. ft. of gas per day from Bartlesville at 4,710-54 ft., TD 4,862 ft.

Pawnee County: Extension to No. Mannford district—Swift Bros. 1 Lewis, SW SE SE 20-20n-9e, pumped 15 bbl. of 40.2°-gravity oil per day from Red Fork at 2,168-88 ft., TD 2,190 ft.

Payne County: New pay in So. Mehan field—Hill & Hill 1 Stockton, NW NW SW 35-18n-3e, flowed 55 bbl. of 45°-gravity oil per day from Simpson at 4,388-4,401 ft., through $\frac{1}{4}$-in. tubing choke, tubing pressure 140 psi., TD 4,402 ft.

OKLAHOMA WILDCAT FAILURES

Carter County: Gibson 1 Bratcher, NE SE SW 5-5s-1e, dry, TD 3,063 ft., oolitic lime 628 ft., Pennsylvanian conglomerate 1,665 ft., Viola 1,685 ft., bromide dense 2,475 ft., shale 2,950 ft.

Comanche County: Benton Ross 1 McClung.

OKLAHOMA

Old Osage County Pool Gets 1,054-Bbl. Producer

THE virtually abandoned Nelagoney pool, southeast of Pawhuska, in Osage County, has been revived by a newly drilled well which flowed 1,054 bbl. of clean oil in 24 hours in a test of Bartlesville sand at 1,990-2,030 ft. The well, E. E. Kirkpatrick 1 Osage, SE SE SE 20-25n-10e, adjoins the Nelagoney townsite on the south and offsets old abandoned producers.

Flow was through 7-in. casing cemented at 1,946 ft. with open hole to total depth at 2,038 ft. Sand was shot with 160 qt. of nitro-glycerin prior to the test. Before shooting, the well flowed at the rate of 4 bbl. per hour. Gravity of the oil is approximately 37° A.P.I. Since the test, 2-in. tubing has been run, this being set at point 14 ft. off bottom. Completion test are under way. Previous production in the pool has been from both the Bartlesville and the Mississippian. Only a few small stripper wells remain.

In another part of the same county, A. G. Oliphant is attempting to open some additional new production in his 1 Osage, SE SE SW 22-25n-3e. Located about a mile east of old production in the Big Bend pool, the well encountered favorable oil showings in Pennsylvanian sand, topped at 2,664 ft. with 7-in. casing on top of the pay, swabbing tests are being started. Bottom of the hole is at 3,738 ft., 3 ft. in the Mississippian.

Ray P. Diehl's prospective discovery well at 1 Hall, NE SE NW 10-16n-3e, $\frac{3}{4}$ mile northwest of Tyron, Lincoln County, has been flowing, with intermittent agitation, from 70 to 75 bbl. of oil daily, and, now, production packer is to be set for completion. Production is from Red Fork sand with open hole at 4,140-60 ft. Nearest production is in the West Agra pool, 3 miles to the northeast. Hole was drilled to the Bartlesville at a total depth of 4,262 ft., and then plugged back.

Aurora Gasoline Co. 1 Gragg, SE SW SE 19-12n-7e, southwestern Okfuskee County, swabbed at the rate of 30 bbl. of oil daily natural but will be shot in an attempt to improve production. Pay zone is the Red Fork sand at 3,327-38 ft., which is the equivalent of one of the productive horizons of the Garden Grove field, a short distance to the south, but several dry holes have been drilled between it and that pool, indicating that it may open a new producing area. It also is only $\frac{1}{2}$ mile southeast of the one-well North Garden Grove pool, but production there is from the Hunton lime.

A prospective new pay zone for the area 2 miles southeast of Chandler, Lincoln County, is indicated at Great Lakes Carbon Co. 1 Bridge, SW NW NW 24-14n-4e, which encountered saturation in Red Fork sand at 4,046-56 ft. In a 20-minute drill-stem test of that interval, 30 ft. of oil-cut mud was recovered. Oil string has been run to 4,042 ft. with bottom of the hole at 4,066 ft.

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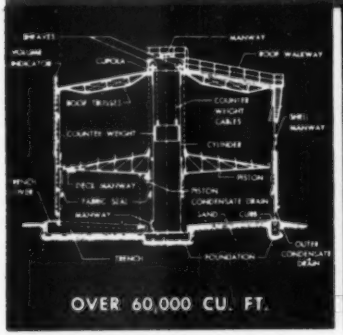

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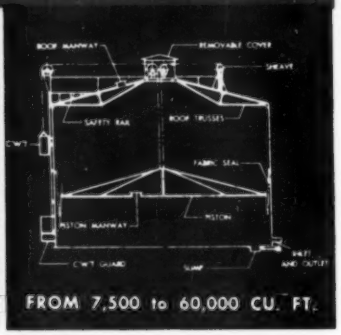

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SE NW NW 29-4n-12w, dry, TD 315 ft.
Cotton County: Johnson 1 Sessums, NE NE SW 24-5s-12w, dry, TD 2,005 ft., fusilinid 1,574 ft., Thomas sand 1,646 ft., Megargel lime 1,750 ft., sand 1,811 ft.
Creek County: Martin 1 Bishop, NW NW SE 34-15n-9e, dry, TD 3,682 ft., Mississippi lime 3,260 ft., Woodford 3,547 ft., Sylvan 3,575 ft., dolomite 3,665 ft., Wilcox 3,672 ft.
Kay County: Swanson et al 1 Sheets, NE SE NW 24-25n-1w, dry, TD 4,400 ft.
Osage County: Platter 2 Osage, SW SW SW 8-22n-9e, dry, TD 2,379 ft.

EASTERN TEXAS

New Sand Production Found in Wood County

DALLAS.—Seven miles north of Hawkins field, in Wood County, F. R. Jackson and others 1 J. A. Durrett, David Gilliland Survey, was assured of discovery production from an unidentified sand at 4,796-4,806 ft., total depth.

In testing open hole at the above depth, the well started flowing after being swabbed 15 hours. In 3 hours, flowing through ¼-in. choke, at 250 psi. pressure, it gaged 11.3 bbl. of clean oil the first hour, and at the end of the test had flowed 30.5 bbl. of oil. Estimated gas-oil ratio was 200 cu. ft.

Operators then set 2½-in. tubing at 4,794 ft., without packer, and in 24 hours the well gaged 189 bbl. of clean oil, through ¼-in. choke. Flowing tubing pressure was 165 psi., and gravity was 26.3°.

Continental Oil Co. 1 Royall National Bank, Anderson County exploration, was running casing at last report. Total depth was 10,182 ft., plugged back to 9,822 ft., in the top of the Travis Peak.

Four miles south of Frankston, Anderson County, Humble Oil & Refining Co. 1 J. T. Ellis, W. A. Dunnagan Survey, A-236, was dry at 6,035 ft. in sand and shale. A 5-hour drill-stem test of the Woodbine from 6,014-35 ft., using ¼-in. chokes and 1,000 ft. of water cushion, recovered the water cushion plus 840 ft. of salt water. Bottom-hole flowing pressure was 1,965 psi.

R. J. Caraway 1 E. A. Chance, deep test in Pittsburgh field, Camp County, was waiting on orders, with a fish still in the hole, according to field reports. Total depth was 13,373 ft., in salt. In coming out of the hole, drill pipe stuck, and was backed off at 8,500 ft.

In Hunt County, 2 miles north of Carter Prairie, W. M. Coats 1 W. A. Carter, W. R. Steel Survey, A-1023, was drilling sand at 3,560 ft. Sample top on the Woodbine was 2,970-80 ft., which carried salt water. It is a new 5,000-ft. wildcat to test the Rodessa.

Stratton Drilling Co. 1 T. E. Allen, Jr., William Becknell Survey, 1 mile southwest of Bagwell in Red River County, was dry in sand and shale at 1,949 ft. Twenty-four hours of pumping on perforations at 1,793-1,814 ft. recovered wash water and fresh water with light sulfur taste and slight show of dark brown oil.

In Tyler Paluxy field, Smith County, Humble 1 Fannie Watson, Oliver Anderson Survey, A-30, completed for 218.4 bbl. of clean oil in 24 hours, flowing through ¼-in. choke, under tubing pressure of 90 psi. Corrected gravity was 27.2°.

One mile northwest of Mount Sylvan, Smith County, A. O. Phillips 1 E. G. Staples, Paluxy discovery, completed for 309.4 bbl. of pipe line oil in 24 hours, flowing through ½-in. choke. Flowing tubing pressure was 40 psi., and shut-in pressure was 525 psi. Production was from perforations at 7,556-68½ ft.

In Titus County, W. M. Coats 1 P. H. Pewitt, Henry P. Banks Survey, A-13, fault zone Paluxy discovery, pumped 331.15 bbl. of 18.6°-gravity oil in 24 hours, from perforations at 4,507-32 and 4,537-41 ft. Gas-oil ratio was around 200 cu. ft. Top on the Paluxy sand was logged at 4,510 ft., on ele-

vation of 284 ft. Total depth was 4,543 ft. with 5½-in. casing set on bottom.

EAST TEXAS (DISTRICTS 5, 6, AND 6-P)

Henderson County: Guy Sitton 1 O. E. Melton, Sharp Whitley Sur., 8 mi. N Trinidad, dry, TD 1,003 ft., Nacatoch 885 ft. by samples.

Kaufman County: O. W. Killam 2 J. B. Freeman, J. M. Luton and G. N. Sawyer Surs., 4½ mi. SW Scurry, 3,250 ft. NE of first dry hole, dry, TD 4,565 ft., Paluxy 3,175-3,410 ft.

Navarro County: Coffield & Guthrie, Inc., 1 R. E. Tatum, Wilson Reed Sur., 2 mi. E Navarro, dry, TD 3,212 ft., Woodbine 3,194-3,212 ft. carried water.

Sabine County: S. J. Carnes 1 Ida C. Lord, Wm. Speight Sur., A-193, 6 mi. N Milam, dry, TD 6,305 ft., Austin 3,660-4,110 ft., Georgetown 4,185 ft., upper Glen Rose 4,760 ft., Mooringsport 5,580 ft., elev. 212 ft.

Smith County: Miles Production Co. and J. E. Fleming 1 D. Crews estate, I. T. Simms Sur., 5 mi. NE Lindale, dry, TD 8,007 ft., Pecan Gap 3,115 ft., Austin 4,500 ft., Woodbine 5,285-95 ft., Comanche 6,125-35 ft., Goodland 7,490 ft., Paluxy 7,654 ft., sand 7,670 ft., by samples, elev. 378 ft.

Van Zandt County: Trinity Production Co. 1-A Humble-Charles Wolverton estate, F. C. Wills Sur., 1 mi. S Wills Point, dry, TD 5,667 ft., Paluxy 5,626 ft., elev. 540 ft.

LA.-ARK.

Caddo-Pine Island Field Gets New Pay Horizon

SHREVEPORT.—A new pay for its section and an offset location were reported this week for Caddo-Pine Island field of Caddo Parish. The discovery was Blackwell Oil & Gas Co. A-1 Muslow, SE NW 9-20n-15w, which was estimated as producing 200 bbl. of 28°-gravity oil a day, without water, from perforations in the upper Glen Rose at 2,879-95 ft. The well was drilled to the Pettit lime at 4,440 ft., then plugged back for completion. Further details were not available.

Blackwell staked location for a confirmation test as the 2 Muslow, approximately ½ mile west of the discovery. Both wells are said to be on a block of between 2,000 and 3,000 acres, assembled by R. M. Tate and R. M. Giles.

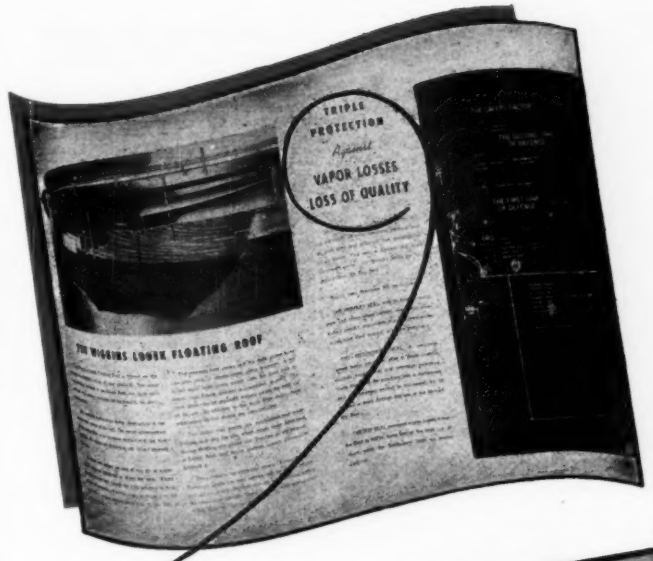
In Bossier Parish, C. H. Murphy 1 Crystal Oil & Refining Co., 14-21n-12w, was drilling below 8,053 ft., still in the Travis Peak. Union Producing Co.'s deep test in Sligo field, the 13 Unit, 13-17n-12w, cored from 7,950-8,000 ft., the 50-ft. recovery being: 29 ft. of shale, 3 ft. of sandstone with faint gas odor, and 18 ft. of nonporous sand with faint gas odor. A drill-stem test from 7,982-8,000 ft. recovered 8 ft. of distillate and 15 ft. of distillate-cut mud in 12 minutes.

A core from 8,100-50 ft. recovered 9 ft. of slightly porous, fine-grained sand with gas odor on fresh break, and 36 ft. of sand with no shows. From 8,152-8,250 ft. the recovery was shale and tight sand with no shows. From 8,250-8,300 ft. the recovery was 35 ft. of shale with no shows, 11 ft. of sand with slight gas odor, 1½ ft. of shaly sand with no shows, and 2½ ft. of fine-grained sand with gas odor. Core top on the Bodcaw was 8,101 ft.

Ohio Oil Co. and Gulf Refining Co. 1 O. L. Martin, 3-22n-7w, was coring at 9,071 ft. in the Cotton Valley. Top on the Bodcaw section, by cores, was 8,010 ft.

E. C. Laster 1 C. F. Grimes, Rodessa wildcat 3 miles southeast of Stonewall in 26-15n-14w, DeSoto Parish, treated with 11,000 gal. of acid through perforations in the Rodessa at 5,131-36 ft., made a flow of acid water and died. Total depth was 5,284 ft.

In Little River County, Arkansas, R. W.



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Burnett 1-A Wickless, 5-13s-31w, 12 miles west of Ashdown, was drilling in the Travis Peak at 2,958 ft. Projected depth on the new wildcat was not reported.

Jones & O'Brien, Inc., 1 Union Saw Mill, 19-18s-12w, Union County wildcat, was in the Cotton Valley at 4,034 ft., and was drilling ahead at 5,650 ft.

Marine Oil Co. 1 Culberson estate, 1-18s-14w, Union County, was drilling below 3,112 ft., in the lower Glen Rose, after testing an oil-showing sand from 2,555-78 ft. A drill-stem test, open 15 minutes, recovered 90 ft. of oil-cut mud. Core recovery from 2,230-47 ft. had 1½ ft. of porous sand with oil show.

NORTH LOUISIANA SUCCESSFUL WILDCAT

Catahoula Parish: New pool—Marine Oil Co. 1 Farrier, NE SW 19-5n-6e, flowed 168 bbl. of 37°-gravity oil a day, 11/64-in. choke, perf. Wilcox 5,855-57 ft., top Wilcox 4,074 ft., TD 6,024 ft., flowing tubing pressure 275 psi., elev. 52 ft.

NORTH LOUISIANA WILDCAT FAILURES

Caldwell Parish: C. H. Murphy & Co. 1 W. W. Meredith, 41-13n-4e, dry, TD 6,505 ft., Cane River 1,080 ft., Wilcox 1,354 ft., Midway 3,320 ft., Arkadelphia 3,992 ft., chalk 4,014 ft., Buckrange sand 4,347 ft., Tuscaloosa 5,258 ft., Massive 5,724 ft., no sand present, Paluxy 6,114 ft., elev. 78 ft.

East Carroll Parish: Petersen Drilling Co. 1 Levi, 51-18n-13e, dry, TD 4,001 ft., Wilcox 2,080 ft., Clayton chalk 3,716 ft., gas rock 3,733 ft., no Massive sand, Paluxy 3,761 ft., sand 3,764 ft., elev. 90 ft.

Ouachita Parish: Nebo Oil Co. 1 LaSalle Land Co., NW NW 15-15n-4e, dry, TD 4,588 ft., Wilcox 1,017 ft., Midway 2,265 ft., gas rock 2,803 ft., Tuscaloosa 3,460 ft., Paluxy 4,180 ft., elev. 66 ft.

Sabine Parish: Union Oil Co. of California 1 Ruth Ferguson, SE NW 11-7n-11w, dry, TD 6,454 ft., Arkadelphia 2,386 ft., Austin chalk 3,944 ft., lower Cretaceous 4,115 ft., Glen Rose 4,652 ft., Mooringsport 5,380 ft., Rodessa 6,270 ft., elev. 270 ft.

ARKANSAS SUCCESSFUL WILDCAT

Franklin County: New pool, "Cecil"—Arkansas-Louisiana Gas Co. 1 Ralph S. Barton, SE SE NW 27-9n-28w, TD 6,650 ft., PB 5,000 ft., perforated Hale sand 4,850-4,930 ft., acidized with 5,000 gal., flowed 7,000,000 cu. ft. of dry gas daily, rock pressure 1,224 psi., Hale 4,849 ft., Hunton 5,933 ft., Viola 6,207 ft., St. Peter 6,312 ft., Everton lime 6,474 ft., elev. 815 ft.

ARKANSAS WILDCAT FAILURE

Little River County: R. W. Burnett 1-C William Sivley, SE SW SE 35-12s-31w, dry, TD 3,547 ft., Massive anhydrite 2,368-2,446 ft., James 2,738 ft., Travis Peak 2,885 ft., Cotton Valley 3,412 ft., elev. 342 ft.

ROCKY MOUNTAIN

Fiddler Creek May Link With Hay Creek Area

DENVER. — Additional good completions in the Fiddler Creek area, Weston County, Wyoming, indicate that there is a good possibility that the productive area will be extended between Fiddler Creek field 12 miles west to the Hay Creek area. Frontier Refining Co. completed its 1 Malette-Government, SW NW NW 30-46n-65w, for a gage of 130 bbl. per hour, through choke. The Newcastle was topped at 5,549 ft. and the well was drilled to 5,600 ft., total depth. There are now eight wells in this area, 6 miles west of Fiddler Creek proper, that have had extremely good initials on production from the Newcastle sand. Schlaikjer Brothers found the sand, topped at 6,238 ft., high and tight to 6,243 ft. at the 1 Sterling, NW SW NW 33-46n-66w, and the well is being plugged. Mule Creek and H. & H. Drilling Co. at 1 Government, NE SW SW 30-46n-65w, tested 65 bbl. of oil per hour for 7 hours through 1-in. choke with the Newcastle between 5,534-46 ft. It is of interest in this area that the producing sand is somewhat more coarse than in the Mush Creek-Skull Creek area, southeast of Fiddler Creek, with the result that recoveries are expected to be higher than they are in the Mush Creek area proper. Production in the new area is apparently due to a nosing on the general shore line area along the east side of the Powder River Basin. With the new completions, drilling activity has considerably increased in the area and there are now approximately 15 rigs running in the Fiddler Creek-Hay Creek area.

Failure to find commercial production by the California Co. at its Johns Valley, Utah, wildcat, 1 Unit, NE NW SE 22-35s-2w, Garfield county, will undoubtedly temporarily slow activities throughout this south central area of the state. This wildcat is 20 miles west of the company's suspended operation at Upper Valley. Both operations were extremely expensive. At Johns Valley, the well went to 10,172 ft., total depth, where the hole was lost, and after unsuccessful attempts to regain the hole the well was plugged back to 6,076 ft. It was than redrilled to 7,473 ft., total depth, where it was found dry. The only drill-stem test recorded for this wildcat was between 7,495-7,533 ft. where the recovery was only mud. At this depth the well was in the Kaibab, topped at 7,365. The Rico Hermosa was found at 9,410 ft. At Upper Valley, oil was found in the Mississippian at around 8,800 ft., but on completion test the well made a high percentage of water and was suspended in that formation after successive tests.

Rumors continue concerning the stratigraphic test now being drilled by Continental Oil Co. and Pure Oil Co. on their extensive lease spread northeast of the town of Bismarck in Burleigh County, North Dakota. The well is a tight hole with no release of information including depths. Unconfirmed reports indicate that the operator encountered shows of oil in the Devonian, reportedly at around 5,750 ft. and that the well is now drilling somewhere below this depth. No drill-stem tests were rumored on this wildcat which is considered of great importance to future activities on the eastern side of the Williston Basin of North Dakota and northeastern Montana. Continental and Pure started this campaign early last spring and reportly have more than 1,500,000 acres leased in the area. It is estimated that more than 3,000,000 acres are leased throughout the entire basin at the present time. Recently Union Oil Co. of California, Hancock Oil Co., and Signal Oil Co. started operations on a strat test in the Devils Lake area, Ramsey County, North Dakota. This well is now reported drilling below 1,500 ft.

MONTANA SUCCESSFUL WILDCAT

Blaine County: New pay in Bowes field—Northern Ordnance, Inc., 1 Guertzgen, SW NW NE 2-31n-19e, TD 3,586 ft., perf. 4 shots per ft. at 3,377-3,419 ft., acidized with 750 gal., swabbed 323 bbl. of oil in 21½ hours from Ellis at 3,378-3,410 ft.; Eagle sand 590 ft., Virgelle sand 790 ft., Colorado 953 ft., Kootenai 2,726 ft., Lakota 2,980 ft., Ellis 3,015 ft., Madison 3,564 ft.

WYOMING SUCCESSFUL WILDCAT

Hot Springs County, Little Sand area: Husky and Seaboard 3 Gov't., NW SW NW 2-44n-96w, TD 6,166 ft., flowed 320 bbl. of oil per day from Embar at 5,940-6,016 ft., ¾-in. choke; Frontier 2,750 ft., Mowry 3,198 ft., Thermopolis 3,550 ft., Muddy 3,742 ft., Dakota 3,950 ft., Fuson 4,043 ft., Lakota 4,176 ft., Marrison 4,210 ft., Sundance 4,423 ft., Gypsum Springs 4,750 ft., Chugwater 4,885 ft., Dinwoody 5,885 ft., Embar 5,940 ft., Tensleep 6,160 ft.

WYOMING WILDCAT FAILURE

Crook County, Moorcroft area: M. D. Miller 1 Waymeyer, NW NW NE 12-50n-67w, dry, TD 1,115 ft., Dakota 883 ft., Lakota 998 ft.

UTAH WILDCAT FAILURES

Garfield County, Johns Valley area: The California Co. 1 Unit, NE NW SE 22-35s-2w, dry, TD 10,172 ft., Navajo 3,650 ft., Chinle 5,735 ft., Shinarump 6,295 ft., Kaibab 7,365 ft., Coconino 8,288 ft. (?), Rico Hermosa 9,410 ft. (?), elev. 7,794 ft. DF, lost hole and redrilled from PB 6,076 ft. to 7,473 ft., TD.

Grand County, Saltwater area: Pacific Western 1 Sharp-State, C NE NE 32-33s-17e, dry, TD 5,046 ft., acidized with 2,000 gal., swabbed dry, 10¾-in. casing at 901 ft., Carmel 360 ft., Navajo 485 ft., Wingate 905 ft., Chinle 1,385 ft., Shinarump 1,627 ft., Moenkopi 1,635 ft., Kaibab 1,943 ft., Rico Cutler 2,725 ft.,

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Hermosa 2,928 ft., Paradox 4,759 ft., Paradox salt 5,026 ft.

San Pete County, San Pitch area: Mountain States Exploration-Carter 1 Brotherson, C SW SE 13-15s-3e, dry, TD 1,730 ft., no shows.

N. CENTRAL TEXAS

Archer County Activity Continues After New Strike

WICHITA FALLS.—Archer County reports included the completion of a good Strawn flowing well, and a number of new locations.

Nines miles southeast of Holliday and 2 miles north of Chalk Hill field, Neeld & Hood 1 L. F. Wilson, Block 59, ATNCL Survey, flowed 210 bbl. of 42°-gravity oil in 6 hours, for a daily potential of 840 bbl. Flowing pressures and choke sizes were not immediately available. Completion was in the Strawn sand from 3,962-76 ft.

P. P. Langford, Jr., Wichita Falls, staked a southwest outpost to the above well in north-central Archer County, as the 1 L. F. Wilson Estate, 330 ft. from north and west lines, of the east half, northwest quarter, Block 63, ATNCL Survey. Location is ½ mile south and slightly west of the discovery.

Stanolind Oil & Gas Co. had drilling under way at its 1 E. J. Stump, 2,970 ft. from north and 1,650 ft. from west lines, Block 1, BBB&C Survey. The new 5,000-ft. wildcat is 6 miles south of Mankins in northwestern Archer County, and on the north edge of an old shallow area.

Montague County.—Konrad Sztykgold 1 H. C. Bradley, Block 10, MEP&P Survey, wildcat 4 miles southeast of Nocona, was reported swabbing at the rate of 30 bbl. of oil a day through perforations in the Caddo conglomerate at 5,902-12 ft., after treating with 4,000 gal. of acid. Further details were not available.

The Texas Co. 1 H. E. Haws, W. H. Morrow Survey, between Hildreth and Lewis-Stuart fields, had a show of oil in drill samples from 6,278-98 ft., believed to be in the Caddo. A 2-hour drill-stem test from 6,252-58 ft., had gas in 19 minutes, and was still in progress at last report.

Wichita County.—Hale & West 1 WVF-McKinnon, M. Loyd Survey, 8 miles southwest of Wichita Falls and 2 miles northeast of Norwood field, pumped 68 bbl. of 43°-gravity oil a day, on initial potential test, after shooting with 120 qt. in sand from 4,367-80 ft.

Taylor County.—Humble Oil & Refining Co. 1 J. M. Wagstaff, Block 432, A. Winters Survey, in Lawn field, completed on the pump for 25½ bbl. of oil a day, from pay at 4,095-4,112 ft., total depth. Humble 2 J. M. Wagstaff was located 330 ft. from south and 480 ft. from east lines of Section 432, as a northeast offset to the 1 Atwood, discovery well.

Stephens County.—New wildcat locations during the week included The Texas Co. 1 J. K. Van Winkle, 330 ft. from south and east lines, north half, Section 87, BAL Survey. The 3,700-ft. rotary wildcat is about 1½ miles east of Eolian and the same distance north of production.

Connally-Thornton and others, Abilene, have made permit to drill 1 H. W. Hart, a 4,300-ft. rotary test to the Ellenburger, 7 miles southeast of Breckenridge, and about 1 mile east of production. Location is 990 ft. from west lines and 1,650 ft. from north line of Section 2065, TE&L Survey.

NORTH CENTRAL TEXAS (DISTRICTS 9 AND 7-B) SUCCESSFUL WILDCATS

Archer County: Neeld & Hood Drilling Co. 1 L. F. Wilson estate, Lot 3, Blk. 59, ATNCL Sur., 9 mi. SE Holliday, flowed 210 bbl. of 42°-gravity oil in 6 hr.

Cooke County: R. B. Hollandsworth 1 M. W. Thomason, T. D. Bell Sur., A052, 1½ mi. S Leo, flowed 1,000,000 cu. ft. of gas daily, TD 2,392 ft., top pay 2,285 ft., shut-in pressure 900 psi., flowing pressure not reported.

Jack County: Warren Oil Corp. 1 Gresham-Davis, John Little Sur., A-2272, 6 mi. NW Jacksboro, flowed 193 bbl. of 44°-gravity oil a day, 14/64-in. choke, GOR 980 cu ft., CP 800 psi., TP 200 psi., Ellenburger pay topped at 5,695 ft., TD 6,051 ft., PB 5,780 ft., elev. not reported.

Parker County: Bus Morgan 1 Darrell O'Neal, M. Waugh Sur., A-1615, 2 mi. NW Springtown, flowed 32.6 bbl. of 45.5°-gravity oil a day, plus 50 per cent water, 20/64-in. choke, Ellenburger 6,658-88 ft., TD, elev. 959 ft., 20/64-in. choke, GOR 10,100 cu. ft., TP 200 psi.

Wichita County: Hale & West 1 W. F. McKinnon, W. M. Lloyd Sur., A-172, 8 mi. W Wichita Falls, pumped 68 bbl. of 43°-gravity oil a day, pay 4,367 ft., TD 4,380 ft., elev. 980 ft.

NORTH CENTRAL TEXAS (DISTRICTS 9 AND 7-B) WILDCAT FAILURES

Archer County: Neeld & Hood Drilling Co. 2 J. S. Bridwell, Blk. 17, Wm. B. Aldridge Sur., 5 mi. NE Geraldine, dry, TD 1,652 ft.

J. E. Jackson and John Jackson 1 Grace Bell, Sec. 1, SPRR Sur., A-406, 1 mi. E Archer City, dry, TD 3,950 ft.

Brown County: Brock & Birdwell 1 Ben Garnes, Sec. 22, HT&B Sur., 1½ mi. NE Bangs, dry, TD 1,020 ft.

Cooke County: Utex Oil Co. 1 T. G. Moss, S. R. Knight Sur., A-559, 1 mi. E Leo, dry, TD 2,390 ft.

Eastland County: Gilchrist Drilling Co. 1 H. H. Durham "D," 17-4-H&TC, 5 mi. N Eastland, dry, TD 1,737 ft.

Haskell County: T. D. Humphrey 1 John Behringer, G. B. Cook Sur., A-89, 6 mi. NW Rule, dry, TD 5,046 ft., elev. 1,510 ft., Flippen 2,610 ft.

Jones County: L. R. Hall trustee 2 B. J.

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Rutledge, F. Sieberman Sur. 13, 5 mi. Ne Abilene, dry, TD 1,740 ft.

Palo Pinto County: Bridwell Oil Co. 1-B J. R. Holsell, Sec. 1757, TE&L Sur., 7 mi. NW Graford, dry, TD 4,707 ft., Caddo 4,166 ft., Marble Falls 4,670 ft.

Shackelford County: Ace Drilling Co. 1 G. R. Davis, Sec. 220, ETRR Sur., 8 mi. SE Lueders, dry, TD 1,704 ft.

J. Conley Niles 1 J. A. Mathews estate "B," Sec. 579, TE&L Sur., 3 mi. N Albany, dry, TD 908 ft.

Taylor County: Geochemical Surveys, Inc., 1 Mrs. Zenia Miller, Sec. 31, BAL Sur., 2½ mi. E Abilene, dry, TD 4,034 ft., elev. 1,768 ft., Flippen 1,804 ft., Caps lime 2,678 ft., reef lime 3,290 ft.

Wichita County: S. H. Freeman and H. W. Fleet 1 G. W. Emmert, Williams Brinlee Sur., A-516, 8 mi. N Wichita Falls, dry, TD 4,048 ft.

Young County: Fred R. Harrell 1 E. H. Griffen, Sec. 205, TE&L Sur., 6½ mi. SE Olney, dry, TD 723 ft.

R. W. Darden 1 E. G. Graham, Sec. 3401, TE&L Sur., 4 mi. NW Farmer, dry, TD 901 ft., Gunsight lime 842 ft.

APPALACHIAN FIELD

Manufacturers Heat & Light Gets Shallow Gas Well

PITTSBURGH.—In West Bethlehem Township, Washington County, Pennsylvania, The Manufacturers Light & Heat Co., brought in 1 Wm. Evans, gaging 2,212,000 cu. ft. of gas. The Dunkard sand was topped at 1,112 ft., show of oil and gas at 1,142 ft., with gas production at 1,158-1,163 ft. Total depth is 1,164 ft. In Wharton Township, Fayette County, William E. Snee et al 3 Indian Creek Coal & Coke Co. completed a fishing job encountered at 6,636 ft. and resumed drilling, however at a depth of 6,657 ft. a similar job was encountered. The tools have been removed from the hole and efforts are being made to remove a section of wire line. In Georges Township, Orville Eberly et al 1 N. E. Murphy, elevation 2,560 ft., is drilling at 3,808 ft. In Napier Township, Bedford County, South Penn et al, Snee & Eberly 1 Jesse B. Miller, elevation 1,666 ft., is drilling at 4,937 ft.

Three good shallow sand gas wells were noted in West Virginia: in Brown Creek district, McDowell County, Hope Natural Gas Co. 9371 Crozer Land Association gaged 6,500 000 cu. ft. of gas after acidizing in the Big lime, total depth 2,691 ft.; in Marsh Fork district, Raleigh County, Hope Natural Gas Co. 9374 Gus Mankin gaged 2,324,000 cu. ft. of gas natural from the Ravencliff sand, total depth 1,525 ft.; in Oceana district, Wyoming County, United Producing Co. 18-1570 Pardee Land Co. gaged 2,481,000 cu. ft. of gas after shooting the Berea sand, total depth 4,109 ft.

In New York, Corrigan Oil & Gas Co. claims to have brought in one of the best wells drilled in the western part of the state. Located on Hotchkiss Run in the southwestern part of Cattaraugus County, the strike had an initial natural flow of 30-40 bbl. of oil per day plus approximately 350,000 cu. ft. of gas. Total depth is 763 ft.

SOUTH LOUISIANA

Two Discoveries Pace Week's Work

NEW ORLEANS.—Union Oil Co. of California has gaged the 1 State Lease 1700, gas-condensate discovery in Iberia Parish, for 39 bbl. of 47°-gravity condensate daily and 1,650 cu. ft. of gas through a ⅛-in. choke. The well, bottomed at 11,761 ft., is flowing through perforations at 11,400-15 ft. with 7-in. casing set at 11,650 ft. Tubing pressure is 4,025 psi. The discovery is approximately 700 ft. south of the Vermilion Bay shoreline in the Tigre Lagoon area.

A new sand has been tapped in South Bayou Mallet field, Acadia Parish, by Union Sulphur Co. A-1 Richard Unit. The well is producing 62 bbl. of 30°-gravity oil daily from the 9,177-82-ft. zone. Usual production in this field is from the 9,600-ft. level while in the nearby Bayou Mallet area, an 8,500-ft. sand is tapped. The gage was made through a 9/64-in. choke with 1,320 psi. tubing pressure.

Magnolia Petroleum Co. has completed the 1 Henry heirs, west offset to the discovery well, the 1 Abel West heirs, as another gasser in Holly Beach field, Cameron Parish. The well flowed 4,790,500 cu. ft. of gas daily with 68 bbl. of 52.6°-gravity condensate through an 11/64-in. choke. The well was drilled to 11,484 ft. and plugged back to 10,814 ft. for the test. Production is through perforations at 10,630-60 ft. and the tubing pressure was recorded as 3,772 psi.

Union Producing Co. and M. H. Marr are continuing to core in the 1 Hudson, wildcat test 1 mile north of Big Island production in Rapides Parish. Cores taken at 10,008 ft., 10,116 ft., and 10,059 ft. recovered shale and lime with no shows.

Superior Oil Co. has gaged the A-1 Gulf of Mexico-State B-Lease, discovery offshore from Cameron Parish, for 7 bbl. of 43.5°-gravity condensate plus 3,355,000 cu. ft. of gas daily through 16/64-in. choke. Total depth of the well is 9,390 ft. and production is through perforations at 7,150-60 ft.

Approximately 11 miles offshore from Terrebonne Parish, Magnolia is still trying to get a good test on the A-2 State Lease, Block 72. The venture showed signs of being the company's first oil well in the Gulf; however, operations have been slowed down by rough weather and the attendant barge was moved away from location.

SOUTH LOUISIANA SUCCESSFUL WILDCATS

Cameron Parish: Offshore gas-condensate discovery—Superior Oil Co. A-1 Gulf of Mexico, State B-Lease, West Cameron Block 149, top sand 7,150 ft., TD 9,380 ft., perf. 7,150-60 ft., IP: 7 bbl. of condensate per day plus 3,355,000 cu. ft. of gas, 16/64-in. choke, TP 2,400 psi., gravity 43.5°.

Iberia Parish: Gas-condensate discovery, at South Tigre Lagoon—Union Oil Co. of Calif. 1 State Lease 1700, 700 ft. S of N shoreline of Vermilion Bay, 14s-5e, top sand 11,400 ft., TD 11,761 ft., perf. 11,400-15 ft., IP: 29 bbl. condensate per day plus 1,650,000 cu. ft. of gas, ⅛-in. choke, TP 4,025 psi., gravity 47°.

SOUTH LOUISIANA WILDCAT FAILURES

Beauregard Parish: Atlantic Refining Co. B-1 Sabine River Lumber Co. (W. Meadows area), 29-4s-12w, 5 mi. SW of Neale production, dry, TD 10,963 ft.

Ralph Lowe 1 Long-Bell, 23-2s-8w, 17 mi. NE of Neale production, dry, TD 10,015 ft.

TEXAS GULF COAST

Bee County Test Continues Coring

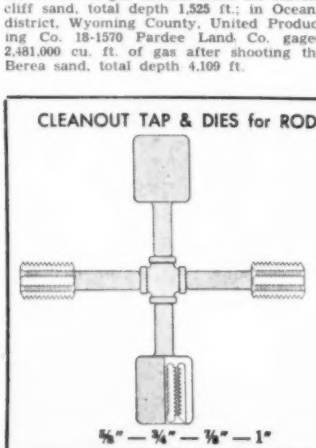
HOUSTON.—Seaboard Oil Co. of Delaware 1 H. H. Striebeck, Bee County wildcat in Peter Allen Survey, A-77, 7 miles west of Mineral, is coring below 6,045 ft. On drill-stem test at 5,974-84 ft., the well had recovered 10 ft. of oil and 10 ft. of mud on 15-minute drill-stem test with ¼-in. choke. Bottom-hole flowing pressure was 700 psi., and shut-in pressure was 2,500 psi. An unsuccessful attempt was made to drill-stem test at 5,984-81 ft. and a subsequent core got salt water sand.

P. T. Sharples plans a 8,000-ft. wildcat on the D. D. Swearingen 160-acre lease, W. R. Parker Survey, Polk County. It will be 17 miles south-southwest of Woodville (Tyler County), 660 ft. south of the north lease line and 660 ft. west of the east lease line.

A. O. Phillips has run a production test on his new shallow discovery at Copeland Creek in Polk County and reports 17 bbl. of 27°-gravity oil per day on ⅛-in. choke. Total depth is 3,352 ft. and 5½-in. casing is cemented at this depth. The well flowed through perforations at 3,338-44 ft. Tubing flowing pressure is 575 psi. and casing pressure 650 psi.

Sterling Oil Co. and Daugherty & Kidd 1 W. Schiel, gas discovery in Montgomery County, has been gaged on open flow for

CLEANOUT TAP & DIES for RODS



⅝" — ¾" — ⅞" — 1"

PRODUCTION TOOLS

by Baird

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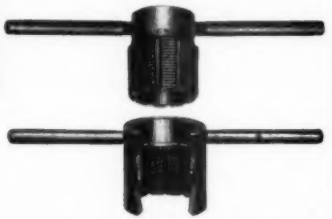
BAIRD MFG. CO.—TULSA

CLEANOUT TAP and DIES for TUBING



2" to 4" PLAIN and EUE ROUND and V-THREAD

Patent No. 2110618

10,400 000 cu. ft. of gas daily. Total depth is 5,675 ft. and production is through perforations at 5,486-91 ft. Well is 2 miles northwest of Tomball field on a 91.35-acre lease in T. J. Stansbury Survey, Abstract 485.

CANADIAN FIELDS

Alberta Gas Discovery Flows 5,000,000 Cu. Ft.

CALGARY.—Alberta recorded another gas discovery this week. The well, South Brazeau 4, LSD 2, 36-31-14w4, about 5 miles northeast of the town of Hanna, on the southeast Alberta plains, rated an open flow potential of 5 000,000 cu. ft. daily from the lower Cretaceous, and has been capped pending available market for its product. It was drilled to total depth of 4,600 ft., failing to find oil in its Devonian objectives. Plugged back, the well gun-perforated casing from 3 742-58 ft., with 64 shots to open up the Cretaceous sand. Drill-stem test after perforating brought gas to surface in 2 minutes.

At Redwater, Imperial Oil, Ltd., added 9 more producers, to raise its total number of successful completions to 56. Canadian Gulf Oil Co. (unit of Gulf Oil Corp.) completed 2 wells, for a total of 23 producers. The Texaco-McColl team placed two more on steady production, for a toal of seven producers. Amerada Petroleum Corp. completed another 2 wells, raising its total to 12. Royalite Oil Co. placed 2 wells on steady yield, for a total of 19. The Anglo-Home team completed 1, to make 12 oil wells. British American Oil Co. placed its first wholly owned Redwater well on steady production. Total number of wells actually on production in this field to date is 209, with another 12 or more expected to complete during the coming week.

At Leduc, Imperial added another D3-zone producer to its large number of oil wells. Calmar West Oils completed its second D2-zone well, and the Home-Anglo-C. & E. team started flowing crude from its eighth joint venture in the Leduc-Woodbend area.

At Whitemud, the New Pacalta Oils group has placed its second successful well on production.

Royalite Oil Co. has completed the preliminary geological survey which will extend its exploratory drilling beyond Alberta for the first time, and has staked location for its first test well on the Queen Charlotte Islands. Location is off the northern British Columbia mainland coast, over 500 miles north of Vancouver, and about 100 miles southwest of Prince Rupert. It is in the southwest corner of a 230,000-acre B. C. Government exploration permit acquired by Royalite last August. Royalite expects to test formations down to at least 3,500 ft., to proble oil and gas possibilities of the Cretaceous and underlying Jurassic formation.

Hanna Pete Syndicate 4, wildcat in LSD 14, 22-32-15w4, entered the D2 zone of the Devonian with around 32 ft. of varying porosity showing with evidence of oil staining. A drill-stem test run on the upper portion of the zone failed to yield. A 40-minute test of the interval 4,648-4,711 ft. gave an initial slight puff, plus pipe recovery of 70 ft. of drilling mud. Coring and testing is continuing at 4,761 ft.

Official figures just issued show that crude-oil production from all Canadian fields in June 1949 totaled 1,701,539 bbl. compared with 1,038,496 bbl. in June 1948. For the first 6 months of 1949 the output was 9,812,770 bbl. against 5,125,461 bbl. for the same period of last year. Alberta production for the 6 months was 9,170,155 bbl. compared with 4,469,997 bbl. for the same period of 1948. Ontario increased from 80,303 to 112,839 bbl., largely due to new production from Becher field; Saskatchewan was up from 375,151 to 410,612 bbl.; New Brunswick declined from 9,835 to 9,807 bbl.; the Northwest Territories were down from 190,175 to 109,357 bbl. The Turner Valley output for the 6 months was 1,956,424 bbl. of crude and 238,948 bbl. of natural gasoline, compared with 2,320,808 bbl. and 230,551 bbl. respectively in the 1948 period. Leduc delivered 4,714,287 bbl. in the 6 months, against 1,283,467 bbl. last year; Lloydminster reported 366,740 bbl. compared with 273,731 bbl. in 1948; Redwater had an entierly new production of 1,535,842 bbl. to swell the 1949 total.

CANADIAN SUCCESSFUL WILDCAT

South Brazeau 4, LSD 2, 36-31-14w4, TD 4,660 ft., capped, IP 5,000,0000 cu. ft. of gas daily.

CANADIAN UNSUCCESSFUL WILDCATS

Bear Biltmore 1, LSD 7, 11-87-17w4, TD 3,863 ft.

C. & S. Shaw 1, LSD 1, 20-51-22w4, TD 5,368 ft.

Spike Redwater 1 (Lloydminster), LSD 10, 29-49-2w4, TD 2,100 ft.

Socony-Morrin 1, LSD 15, 9-32-19w4, TD 6,436 ft.

Bear Beaumont 1, LSD 14, 25-77-18w4, TD 1,687 ft.

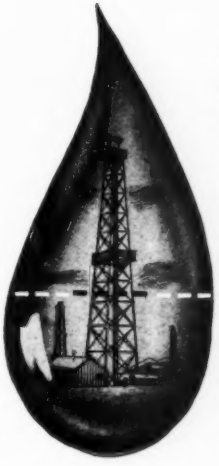
ILLINOIS

Lawrence County Wildcat Opens New Producing Area

MATTOON.—A new producing area 5 miles south of Lawrenceville and 1½ miles from nearest production at the south end of the Lawrence pool, in Lawrence County, is being proved by R. C. Mitcheltree at his 1 Treadway, NW NW NE 32-3n-

First in

CANADA'S OIL FIELDS



The Royal Bank of Canada can answer your questions about Western Canada's fabulous oil development whether you are interested in oil financing in any of its aspects or wish sound advice on establishing business connections in Canada.

The Royal Bank has had branches in Canada's oil fields since the earliest days. Our branch in Turner Valley was opened in 1928 — in Leduc, we opened just one day after the first producing well was completed— in Devon and Redwater, our branches opened last spring. So closely identified has this bank become with Canada's oil development that it has become known as the "R-Oil."

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THE ROYAL BANK OF CANADA

11w. In Rosiclare lime at 1,844-50 ft., with 7-in. casing at 1,798 ft., the well swabbed 12 bbl. per hour natural in an initial 12-hour test. Location has been made for a second well at a 10-acre location north.

First McClosky lime production for the Allendale area in Wabash County is being opened by Hayes Drilling Co. and F. R. Stocker at their 2 John Schafer, SW SE NW 15-1n-12w. With pay at 2,344-60 ft., the well swabbed 8 bbl. per hour. Total depth is 2,365 ft. Location is 1 mile southwest of Allendale.

Sohio Petroleum Co. 1 Poorman, NE NE SW 18-3s-8e, north extension test for the Mills Schoals pool, Wayne County, pumped 1 bbl. of oil and 2 bbl. of water per hour following a 20-qt. shot in the Aux Vases at 3,241-52 ft.

ILLINOIS SUCCESSFUL WILDCAT

Richland County: McDowell & Murvin 1 Tipps, C W½ NW SW 4-2n-10e, IP 10 bbl., McClosky 3,201-04 ft., TD 3,304 ft. (Near North Calhoun pool.)

ILLINOIS WILDCAT FAILURES

Edgar County: National Associated Petroleum Co.-Continental Oil Co. 1 Sellar-Gared, NE NE SE 34-13n-11w, dry, TD 2,247 ft.

Hamilton County: George & Wrather 1 McCoy, SW NE SE 34-5s-7e, dry, TD 3,402 ft.

Lawrence County: J. S. Young, Jr., 1 Lutherland, SE NW NE 13-2n-12w, dry, TD 1,978 ft.

Menard County: A. E. DeFrates 1 Rarkes, NW SE SW 19-19n-6w, dry, TD 548 ft.

Piatt County: National Associated Petroleum Co.-Continental Oil Co. 1 H. Reed, NW NE NE 6-16n-5e, dry, TD 2,490 ft.

CHROMATES CONTROL CORROSION in the PETROLEUM INDUSTRY

Mutual Chemical Company have recently prepared a 16-page pamphlet describing applications in which chromates have been used effectively to prevent corrosion in the petroleum industry. The topics discussed include drilling, production, refining and transportation.

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OHIO, KENTUCKY

Stark County Venture Gets Natural Gas Flow

COLUMBUS.—Ed Obermiller et al 1 Ramson Barr, Section 24, Bethlehem Township, Stark County, a 2/3-mile southeast extension, topped the white Clinton at 4,557 ft. and was drilled to 4,580 ft. with a natural open flow of 600 000 cu. ft. of gas, which increased to 800,000 cu. ft after shot.

In Stewart field, the Ohio Fuel 2 W. Nicholson, Section 29, Rutland Township, Meigs County, reached the Maxon at 862 ft. and finished at 881 ft. with a gage of 1,150,000 cu. ft. of gas natural; Krebs et al 1 S. L. Parker, Section 33, Rome Township, Athens County, was drilled 3 ft. into the Injun sand, found at 1,112 ft., with a gage of 330,000 cu. ft. of gas.

Settles Oil Co. 3 I. T. Gross, Section 9, Riverton Township, Coshocton County, missed the oil pay but picked up 325,000 cu. ft. of gas which will be shot and tubed The Clinton came in at 3,217-60 ft.

H. C. Hofacker et al completed a gas well on Mabel Snyder property, Section 35, Hopewell Township, Perry County. A small natural gage of 170,000 cu. ft., in the Clinton at 3,045-85 ft., responded to a 120-qt. shot and the test shut in at an estimated 700,000 cu. ft.

WESTERN KENTUCKY

OWENSBORO.—A second potentially productive pay zone has been found by Nash Redwine and associates in their 1 Bower Brothers and Henry Walker, 6-Q-22, a wildcat on Diamond Island, in the Ohio River, about a mile north of the Geneva pool, Henderson County. It is the Rosiclare lime, in which a drill-stem test at 2,570-84 ft. resulted in a recovery of 790 ft. of free oil with 40 ft. of oil-cut mud and some water. Hole was drilled to 2,650 ft., after which casing was run through the pay to 2,640 ft.

Previously, saturation had been found in the Tar Springs at 1,955-67 ft., from which 10 ft. of free oil and 50 ft. of oil-cut mud, without trace of water, was obtained in a drill-stem test.

Extension of production in the Henderson area, Henderson County, into the townsite, is indicated at J. V. Canterbury and associates 1 City of Henderson. Saturation was found in the upper part of the McClosky lime at 2,457-65 ft., where a drill-stem test gave a recovery of 125 ft. of free oil with 90 ft. of drilling mud and a trace of water. Operators, however, are drilling ahead to a projected depth of approximately 2,550 ft. before running casing.

J. T. Peek and associates have opened a new producing area 1½ miles west of Poole, Henderson County, in their 1 Barnett heirs, 6-N-23. Following a 20-qt. nitro shot in Jackson sand at 2,242-58 ft., the well pumped at the rate of 60 bbl. of net oil daily with about 5 bbl. of water.

Joe Vail and associates 1 Kurtz, 9-Q-28, outpost in the Griffith pool area, Daviess County, is making an estimated 602,000 cu. ft. of gas daily with a show of oil while testing Waltersburg sand at 1,109-19 ft.

EASTERN KENTUCKY

ASHLAND.—In Knox County, 17-D-68, an old well formerly drilled to a total depth of 2,115 ft., is being deepened to test possible Ordovician pays. The test is Triangle Oil Co.'s 1 Stafford, some miles south of Barboursville, the county seat. Drilling was progressing below 2,345 ft., presumably in the upper Ordovician lime. There have been relatively few deep tests for this county so this well will be followed with much interest by local operators.

Further south in the state, located in Cumberland County, 9-C-50, Collie Ellis et al are drilling at 1,078 ft. at the 1 Merley, a rank wildcat test of the Ma-

(Continued on page 185)

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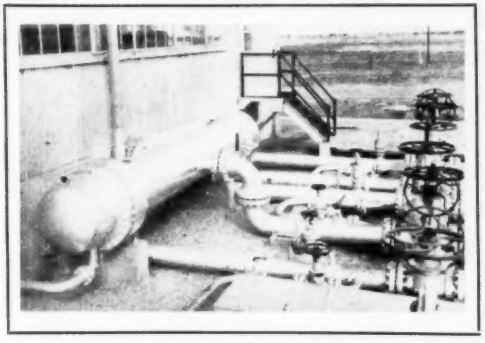
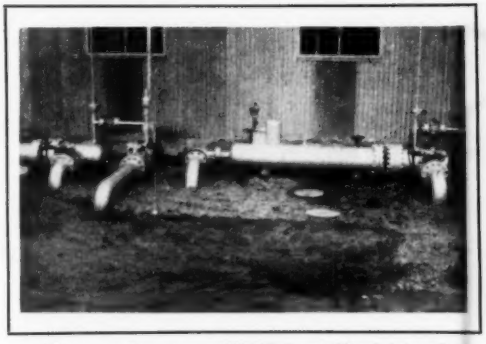
DOLLARS IN INVESTMENT
DOLLARS IN OPERATION
DOLLARS IN MAINTENANCE

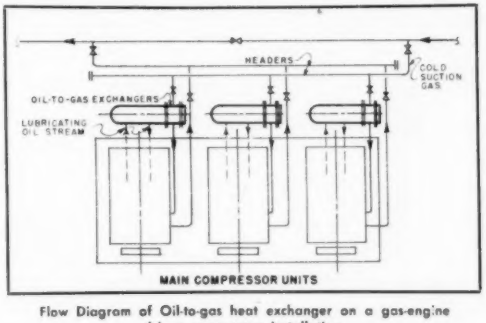
SUBSTANTIAL SAVINGS, up to $25.00 per h. p. in investment, can be realized by using the INTAKE GAS to cool LUBRICATING OIL on gas engine driven compressor installations. Also applicable to SEAL OIL on centrifugal installations.



Oil-to-gas exchanger on a 1600 H.P. Clark installation at a Panhandle Eastern main line station.



Oil-to gas exchanger on a 300 H.P. Ingersoll-Rand Automatic Field Booster Unit in Panhandle Eastern's production field.



Flow Diagram of Oil-to-gas heat exchanger on a gas-engine driven compressor installation.

Installations are designed with adequate safety devices for full protection and also automatic control equipment for maintaining the proper temperature of oil.

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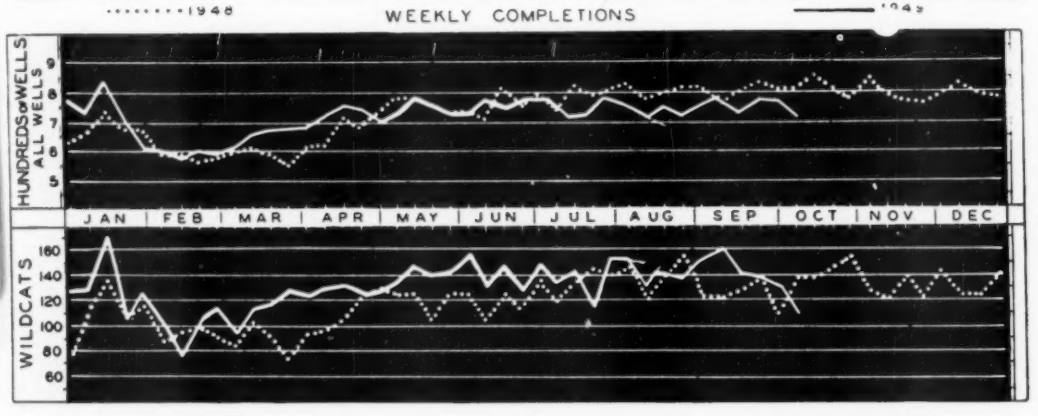
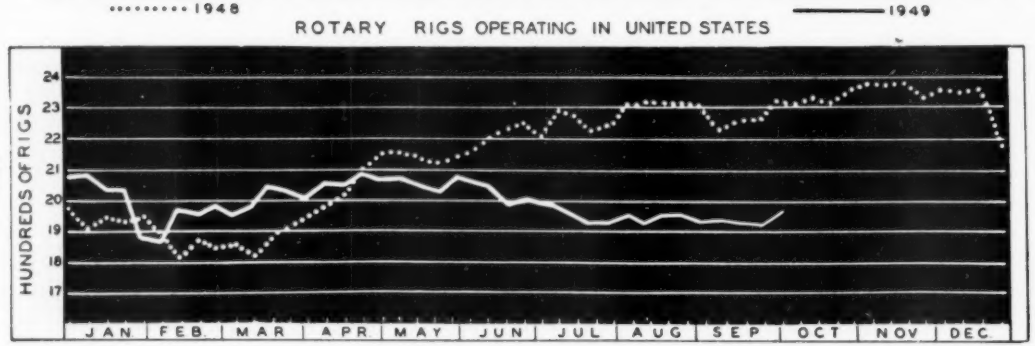
METHOD PATENT 2,424,010

WEEKLY WELL COMPLETIONS . . . . WEEK ENDED OCTOBER 8, 1949

	Total of all wells					Oct. 6		Wildcat completions and discoveries					Cumulative total, 1949				
	Comp.	Oil	Gas	Dry	Footage	1949	1948	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	20	10	0	*10	24,642	609	1,071	0	0	0	0	0	0	0	0	0	0
Pennsylvania	32	13	4	†15	57,380	1,525	2,390	0	0	0	0	0	0	0	4	1	5
West Virginia	7	1	6	0	18,043	376	659	0	0	0	0	0	1	0	11	9	21
Ohio	23	7	9	17	47,191	813	1,047	0	0	0	0	0	1	0	2	25	28
Indiana	37	18	1	18	68,834	987	800	1	0	0	5	6	27	0	2	181	210
Kentucky	13	6	4	3	25,323	728	693	0	0	0	0	0	23	0	0	59	82
Illinois	53	30	0	23	102,604	2,031	1,813	1	0	0	5	6	52	0	1	337	390
Michigan	21	11	0	§10	55,958	769	630	1	0	0	7	8	22	0	3	237	262
Kansas	69	35	15	§19	199,498	2,468	2,427	2	0	0	8	10	59	0	7	317	383
Neb., Mo., Iowa	0	0	0	0	0	19	54	0	0	0	0	0	1	0	0	14	15
Oklahoma	73	53	1	§19	187,060	3,265	3,211	3	1	1	6	11	106	12	15	472	605
Texas	232	149	22	61	953,107	10,014	9,236	6	0	2	33	41	314	40	93	1,742	2,191
North Central (Dist. 7-B & 9)	82	51	1	§30	211,581	3,361	2,878	4	0	1	14	19	148	0	17	691	836
West (Dist. 7-C & 8)	56	46	1	9	296,724	2,424	2,497	2	0	1	6	9	44	1	4	199	248
Panhandle (Dist. 10)	20	5	14	1	62,973	738	498	0	0	0	0	0	1	0	1	9	11
Eastern (Dist. 5, 6, & 6-P)	23	15	1	7	105,901	585	446	0	0	0	6	6	8	4	3	119	134
Gulf Coast (Dist. 2 & 3)	21	15	4	2	115,294	1,470	1,453	0	0	0	0	0	62	28	39	292	421
Southwest (Dist. 1 & 4)	30	17	1	12	159,631	1,466	1,464	0	0	0	7	7	51	7	31	432	521
Louisiana	49	32	5	12	253,031	1,732	1,816	1	2	0	6	9	46	16	4	161	227
Northern	33	20	4	9	86,830	1,031	1,227	1	0	0	4	5	4	2	0	75	81
Southern	16	12	1	3	166,221	701	589	0	2	0	2	4	42	14	4	85	146
Arkansas	9	3	1	5	40,546	245	228	0	0	1	2	3	3	0	1	55	59
Mississippi	3	2	0	1	22,453	259	322	0	0	0	1	1	4	1	1	79	85
Southeastern States	3	0	0	3	15,454	39	38	0	0	0	2	2	1	0	0	33	34
Montana	1	1	0	0	3,586	221	245	1	0	0	0	1	4	0	2	24	30
Wyoming	8	6	0	2	43,622	451	399	1	0	0	1	2	22	0	0	87	109
Colorado-Utah	5	1	1	3	25,404	111	171	0	0	0	3	3	2	0	0	51	53
New Mexico	14	8	3	3	54,547	366	464	0	0	0	2	2	11	1	2	41	55
California	44	29	2	13	178,712	2,030	2,207	1	0	0	8	9	32	0	6	354	392
Total United States	716	415	74	227	2,377,035	29,113	29,921	18	3	4	89	114	731	70	156	4,279	5,236
Total previous week	769	435	60	274	2,682,291			13	1	4	111	129	713	67	152	4,190	5,122
Total October 9, 1948	817	436	62	319	2,857,386			13	2	3	121	139	674	58	197	3,812	4,741

Service wells included: *10, †15, ‡2, §1.





DAILY AVERAGE PRODUCTION FOR WEEK

	Oct. 8 crude oil	B. of M. Oct. demand	Oct. 1 crude oil
Alabama	1,300	1,200	2,100
Arkansas	72,200	84,000	70,800
California	892,100	900,000	891,800
Colorado	64,400	70,000	64,500
Eastern	62,300	60,000	61,900
Florida	975	1,100	980
Illinois	185,400	180,000	179,900
Indiana	27,500	28,000	28,200
Kansas	249,600	302,000	262,650
Kentucky	23,600	22,000	23,400
Louisiana	528,425	526,000	491,900
North Louisiana	117,150		114,300
South Louisiana	411,275		377,600
Michigan	43,150	45,000	44,900
Mississippi	91,150	108,000	98,950
Montana	26,700	25,000	27,000
Nebraska	800	700	550
New Mexico	126,900	134,000	124,200
Oklahoma	413,800	410,000	401,000
Texas	2,026,200	2,190,000	1,988,400
Dist. 1 (Southwest)	27,375		27,200
Dist. 2 (Southwest)	125,300		123,070
Dist. 4 (Southwest)	193,875		189,950
Dist. 3 (Gulf Coast)	379,100		373,880
Dist. 5 (Eastern)	35,225		34,600
Dist. 6 (Eastern)	86,200		83,680
East Texas field	251,700		245,450
Dist. 7-C (West)	51,625		50,500
Dist. 8 (West)	581,325		565,880
Dist. 7-B (W. Central)	63,100		61,570
Dist. 9 (N. Central)	139,275		140,150
Dist. 10 (Panhandle)	92,100		92,470
Utah	2,900	1,000	2,200
Wyoming	128,100	122,000	127,500
Total United States	*4,967,500	5,210,000	4,892,830
Change from previous week, up	74,670		
Canada	70,035		72,500

Total U. S. production January 1-October 8 †1,422,612,230 bbl
Same period last year (crude plus cond.) 1,547,031,975 bbl

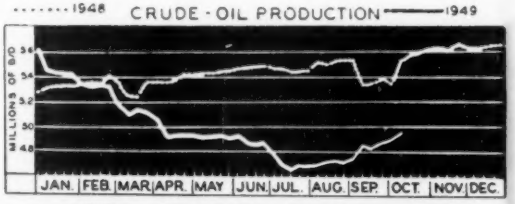
*Not incl. 79,530 bbl. condensate. †Incl. 23,232,570 bbl. condensate.

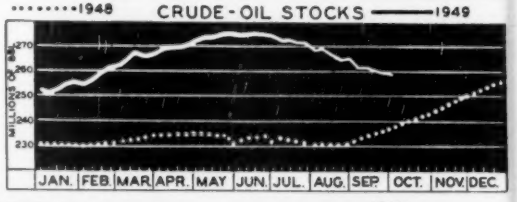
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

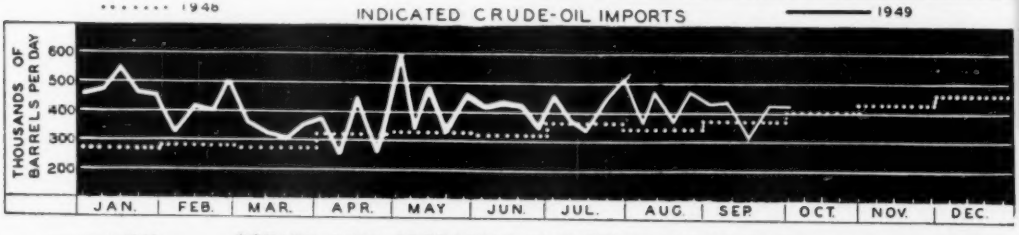
(Thousands of barrels)

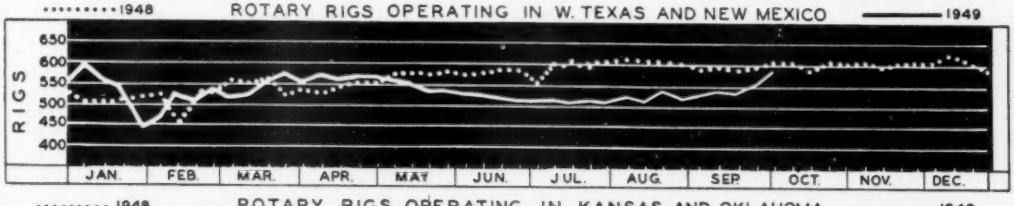
	Oct. 1 1949	Sept. 24 1949	Oct. 2 1948
Pennsylvania Grade	3,191	3,210	2,809
Other Appalachian	1,922	2,114	1,319
Illinois, Indiana, Michigan	12,027	12,595	10,831
Arkansas	2,782	2,849	3,236
Louisiana	13,768	14,473	12,243
North	3,455	3,579	2,723
Gulf	10,313	10,834	9,520
Mississippi	2,623	2,680	2,981
New Mexico	7,349	7,328	5,773
Oklahoma and Kansas	39,302	38,416	34,663
Texas	118,558	118,835	113,229
East Texas	17,140	17,444	17,440
West Texas	46,517	46,738	42,784
Texas Gulf	28,944	29,329	28,767
Other Texas	25,957	25,324	24,238
Rocky Mountain	13,910	13,896	9,503
California	36,575	35,832	33,895
Foreign	6,841	6,961	4,980
Total United States	258,848	259,189	235,462

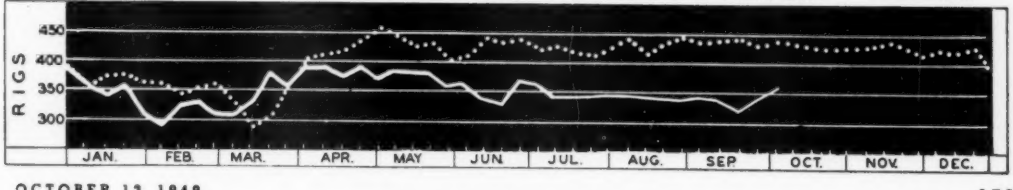
*Bureau of Mines.











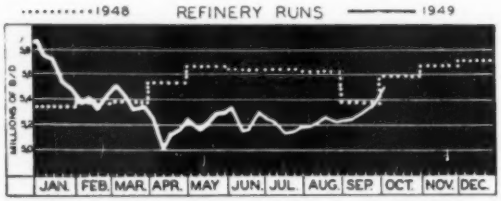
Refining Statistics

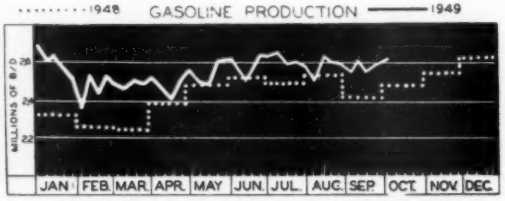
A.P.I. REFINERY REPORT, OCTOBER 1

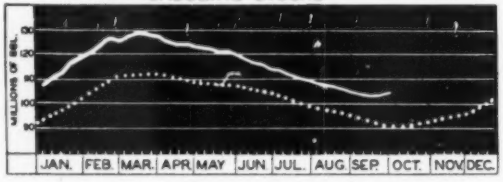
(Thousands of barrels)

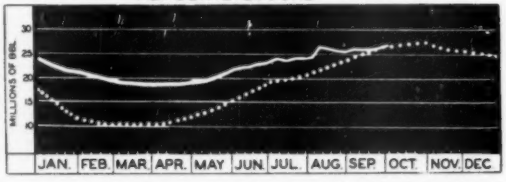
District—	Daily avg. crude runs	Daily average production				Stocks at refineries, bulk terminals, in transit and in pipe lines				Bureau of Mines, September 1948				
		Gasoline*	Kerosine	Distillate	Residual	Gasoline†	Kerosine	Distillate	Residual	Daily avg. crude runs	Daily average production: Gasoline*	Kerosine	Distillate	Residual
East Coast	820	322.7	29.4	168.3	181.9	22,834	11,236	26,399	9,617	878	306.9	36.8	180.8	231.7
Appalachian:														
District 1	94	46.3	7.3	7.6	9.7	2,568	408	771	415	99	42.7	5.4	12.8	13.1
District 2	70	36.1	2.1	10.4	15.4	1,085	140	213	54	27	13.0	1.4	4.6	9.2
Ind., Ill., Ky.	942	538.6	61.6	126.3	139.6	22,557	5,437	13,028	3,761	959	488.7	55.6	132.4	152.5
Okla., Kans., Mo.	426	239.3	14.1	80.0	66.6	8,978	1,646	6,192	1,883	474	248.5	22.6	86.9	76.3
Inland Texas	197	130.1	7.4	23.0	39.4	3,561	876	987	1,440	251	157.9	12.5	24.1	62.9
Texas Gulf Coast	1,395	618.3	66.2	307.3	234.9	15,137	3,595	14,102	7,115	1,427	625.9	102.5	308.9	250.6
La. Gulf Coast	469	206.4	44.0	103.8	62.1	5,509	2,263	4,339	2,507	438	191.7	53.3	82.7	72.5
N. La. and Ark.	70	28.9	6.9	9.6	12.1	2,484	462	845	351	86	33.4	8.0	13.0	18.4
Rocky Mountain:														
New Mexico	12	6.6		1.9	2.9	75	50	96	29	13	6.8	0.5	1.8	3.9
Other Rocky Mtn.	187	81.6	5.7	36.8	34.8	2,532	391	2,085	621	160	70.4	4.3	25.8	31.7
California	811	371.0	14.1	119.6	274.0	16,575	692	14,438	40,162	581	230.2	6.7	103.0	239.8
October 1, 1949	5,493	2,625.9	258.8	994.6	1,073.4	103,895	27,196	83,495	67,955	5,393	2,416.1	309.6	976.8	1,162.6
September 24, 1949	5,377	2,593.1	272.8	936.4	1,059.9	103,262	26,615	81,414	68,143					
October 2, 1948	5,687	2,443.9	335.9	1,033.6	1,181.6	90,453	26,735	73,119	57,992					

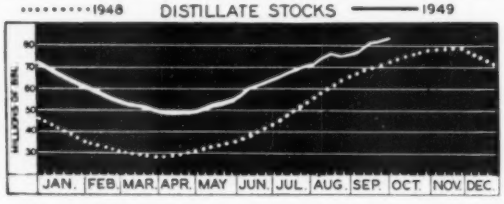
*At refineries including natural blended. †Finished and unfinished.

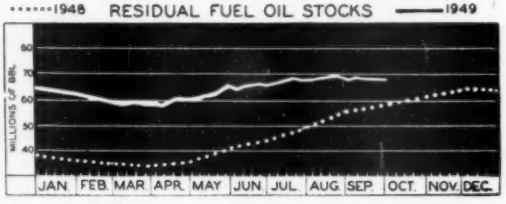


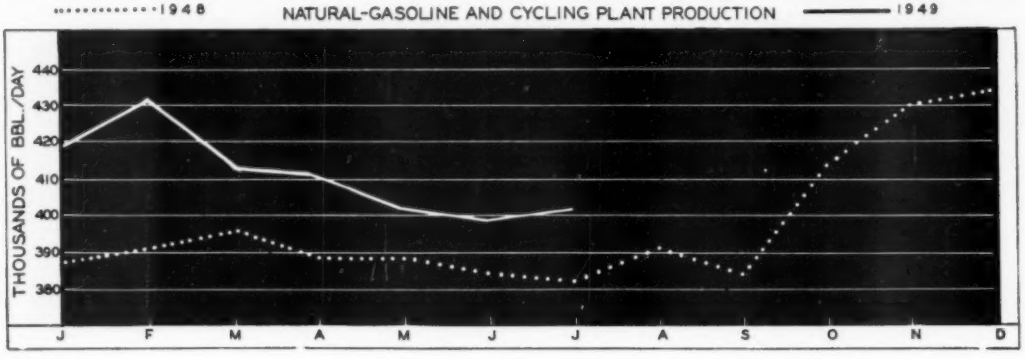












CRUDE PRICES GRAVITY SCHEDULE

Gravity—	Signal Hill, Calif.	Oklahoma, Kansas	Gulf Coast Tex.*	West Tex.†
18-18.9	$1.53	....	....	....
19-19.9	1.63	....	....	....
20-20.9	1.73	$2.25	....	$2.12
21-21.9	1.82	2.27	....	2.14
22-22.9	1.92	2.29	....	2.16
23-23.9	2.02	2.31	....	2.18
24-24.9	2.12	2.33	$2.56	2.20
25-25.9	2.22	2.35	2.56	2.22
26-26.9	2.31	2.37	2.60	2.24
27-27.9	2.37	2.39	2.62	2.26
28-28.9	2.42	2.41	2.64	2.28
29-29.9	2.48	2.43	2.66	2.30
30-30.9	2.54	2.45	2.68	2.32
31-31.9	2.59	2.47	2.70	2.34
32-32.9	2.64	2.49	2.72	2.36
33-33.9	....	2.51	2.74	2.38
34-34.9	....	2.53	2.76	2.40
35-35.9	....	2.55	2.78	2.42
36-36.9	....	2.57	2.80	2.44
37-37.9	....	2.59	2.82	2.46
38-38.9	....	2.61	2.84	2.48
39-39.9	....	2.63	2.86	2.50
40 and above	....	2.65	2.88	2.52

*For crude from Daboval, El Campo and Sand Point.

†Includes Lea County, New Mexico. Last general price change represented a 50-cent increase becoming effective December 6, 1947. Above changes do not include recent reductions of a few buyers applying principally to low-gravity grades.

FLAT CRUDE PRICES

Representative posted schedules per barrel

East Texas†	$2.61
Kettleman Hills, California*	2.77
Beauregard Parish	2.60
Illinois Basin	2.77
Pecos County, Texas (Yates)	2.35
Bradford, Pennsylvania	3.40
Eastern Ill. and Western Ind.†	2.77
Tomball, Texas Gulf Coast	2.83

*37°-37.9°. †35° and above

HEAVY liquidation of residual inventories in areas east of California has resulted from increased demand as well as low refinery output. For the past several weeks, heavy-fuel production in these areas has been running about 14 per cent less than in the same period last year, compared with a decrease in refinery runs of about 5 per cent.

The relatively low level of refinery realization as compared with crude prices has made it necessary for the refiner to get maximum yields of higher-priced products from each barrel of crude.

Heavy fuel is the only major petroleum product with direct day-to-day competition from outside the industry. Many heavy-fuel users can shift from coal to residual or residual to coal on short notice. Electric utilities are particularly susceptible to changes in coal and heavy-fuel prices.

Heavy-fuel prices advanced during 1947 and the early months of 1948 until they were out of balance with coal prices. The result was a loss of much of the heavy-industry and utility market. To regain these markets, prices had to be cut back well below the equivalent prices of coal.

It is now estimated that California-East Coast shipments of heavy fuel will reach 5,000,000 bbl. this winter. This will help relieve the West Coast storage problem as well as supply increasing East Coast demands. Gulf-East Coast stocks are 6,000,000 bbl. less than last year and about 800,000 bbl. less than at the end of September 1947.

REPRESENTATIVE QUOTATIONS

Representative spot-market quotations of leading suppliers as of October 10, 1949. Figures are f.o.b. plant for tank-car shipments in cents per gallon, except for residual fuel oil which shows the price per barrel and wax, in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor (barge)	Tex. Gulf Coast
Regular gasoline, 74-76 octane	9⅝-10	11.125-11.5	9½-10
Premium gasoline, 78-80 octane	10⅜-11	12.5	10½-11
42-44 w.w. kerosine	7¾-8¼	8.9	7¾-8¼
No. 2 straw fuel oil	6¾-7	8.5	7-7¼
No. 6 residual	$0.95-1.00	$1.90	$1.50-1.65

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	5⅞	5⅜	5⅝
Grade 18-55	7.1	6.5	6.8

LUBRICATING OILS SOUTH TEXAS

200 vis., No. 2-3 neutral	10.5
750 vis., No. 3-4 neutral	12.75
2,000 No. 5-6 neutral	14-14.5

LUBRICATING OILS Mid-Continent

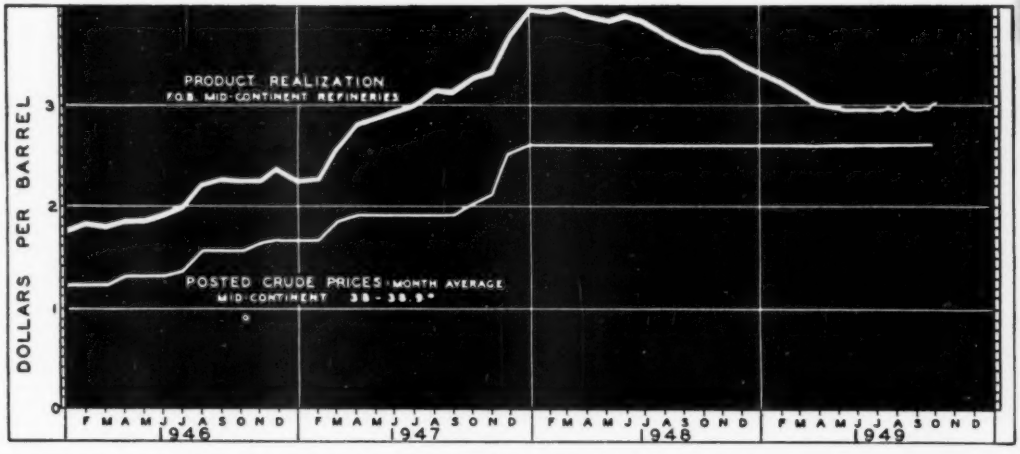
150-160 vis., D bright stock, 0-10 pp.	17-19
200 vis., No. 3 neutral, 0-10 pp.	11.5-14

Western Pennsylvania

145-155 vis., 10 p.t. bright stock	19.5-20
180 vis., 0 p.t. neutral	20.5-21

WAX Mid-Continent

132-134 A.M.P.	4.25



In this trend chart refinery realization is based on average Mid-Continent grade crude oil (not 38° gravity only) and average prices for refinery products as published in The Oil and Gas Journal basis Oklahoma (Group 3). Refinery yields confined to gasoline, kerosine, distillate, and fuel oil

Perlman, Krug Targets In Tidelands Hearing

(Continued from page 65)

providing for state management giving the Government first call on the oil in the event of an emergency at the market price, saying "the people of the United States cannot afford to make a gift of these tremendously valuable resources to a few coastal states, and then buy back their own oil to meet the needs of the nation for defense and other governmental purposes."

Legal authorities of a number of states laid before the committee much the same presentation as they made before the House judiciary committee in August, challenging the position of the Government and bearing heavily on the deliberate omission by the Supreme Court of the Justice Department claim of federal "ownership" of the marginal sea.

"Propaganda" Attacked

In opening the states' presentation, Attorney General Hall Hammond of Maryland, chairman of the submerged lands committee of the National Association of Attorneys General, called the committee's attention to "misleading propaganda" with which he charged the supporters of federal control, among other things that the state officials are being supported and financed by oil companies, that state ownership would deprive the federal Government of oil necessary for national defense and that under federal control the Government will keep private oil interests from producing oil from the tidelands.

Attorney General Price Daniel of Texas also charged federal officials with throwing up a "smoke screen of an imagined fight against private oil interests" and taunted the Government with its failure to make the oil companies parties to its suits.

Louisiana officials asserted that federal Government has no title to the tidelands, the Supreme Court having refused to grant the paramount rights "of proprietorship" in the California lands which the Justice Department asked.

There is no question of the paramount power of the Government, L. H. Perez, special assistant to the Louisiana attorney general, said, but such power does not include the right to confiscate or destroy title or right to property.

Oil-company spokesmen told the committee that the position of the industry generally is that the states should own the submerged lands but its primary concern is to provide oil for the national economy and security and develop a reserve productive capacity that can be immediately made available in the event of war.

Most of their testimony was concerned with the effect upon tidelands operators of federal management, those who have acquired leases in the Gulf of Mexico since the date of the California decision expressing fear that the more than $25,000,000 paid the states for those leases and the further millions expended in exploration and development would be lost, in view of the assertion by the solicitor general that such leases were granted illegally. Any legislation providing for federal administration of the submerged lands should take into consideration the good faith of the operators in the Gulf and accord to those lessees the same privileges of exchanging state for federal leases as are to be accorded operators in California.

The industry spokesmen, as had the attorneys general before them, made unfavorable comparisons of federal vs. state regulations, pointing out the delays which were encountered when dealing with Washington as compared with the speed with which state officials dealt with the problems that come up in the course of operation.

By motion picture and oral testimony, the industry gave the committee a close-up of the tremendous difficulties and costs encountered in underwater development, explaining that so far operators in the Gulf have invested about $200,000,000 while the gross value of all the oil produced up to last September 1 was about $1,300,000

Watching Washington

(Continued from page 63)

as much fuel oil when idling at no load as at full load, and its fuel rate is relatively higher than for a diesel.

Much of the railroads' current research is directed at the use of oil as fuel, and the first train to be fueled by synthetic oil made the run from St. Louis to Louisiana, Mo., last month during the show put on by the Interior Department at dedication of its coal-to-oil demonstration plant. The 1,200 gal. of diesel oil used on the 188-mile round trip was produced during an initial 2-day run in the coal-hydrogenation plant.

Pension Problems

LEGISLATION expanding the social security act has been passed by the House of Representatives, and while the Senate will not act upon it until next year there is a general hope that the certainty of a new law will slow down union demands for company-financed pensions such as the steel and automobile workers are seeking.

The quick action of the House in passing the bill was prompted in large part by warnings that the spread of company-financed, noncontributory pension plans might wreck the social security system, but there is also apprehension in some quarters that it might eventually cripple the economy through the sterilization of funds which is inherent in private pension programs.

Here, according to one economist who has been closely connected with private organizations setting up various types of employe-welfare systems, are some facts which indicate the possibilities:

One important industrial organization with 40,000 employes, which is in line to receive union pension demands, estimates it would have to tie up $100,000,000.

Figuring that unions representing 40,000,000 workers will demand and secure pension plans, 10 or 12 years hence when such systems are fully set up something like $100,000,000,000 might be immobilized, and the flow of risk capital would be dammed up very considerably, with consequent adverse effects upon the oil and other industries which are largely dependent upon such money for expansion of operations.

This 100 billion dollars could be used only for preferred and specified investments, since company pension plans must take the form of trusts which are treated under the state insurance laws which limit the field in which they may be invested.

That is something to think about

Middle East Oil-Price Consultants Recalled

WASHINGTON.—A panel of price consultants which assisted the Economic Cooperation Administration last April in a study of the prices charged for Marshall Plan oil by the companies operating in the Middle East has been called back by Dr. Oscar E. Bransky, acting chief of the petroleum branch, to meet November 1-2 for a review of the present price situation.

Bransky explained that the purpose of the meeting will be to see what the situation is and advise ECA whether current prices can be considered as satisfactory. Since the April meeting of the group, he pointed out, the companies have made two reductions in price.

ECA officials refused to comment on the present price situation or to indicate whether they were dissatisfied with current prices, explaining that anything they said might be interpreted as anticipating the consultants' findings.

The group, to which Walter J. Levy, former chief of the petroleum branch, has been added, consists of Max W. Ball, former director of the Oil and Gas Division; L. S. Wescoat, president of Pure Oil Co.; Sumner Pike, member of the Atomic Energy Commission; Dr. Edward S. Mason, dean of the graduate school of public administration at Harvard University; and Dr. George W. Stocking, professor of economics at Vanderbilt University.

EQUIPMENT MEN ... in the News

Robbins Made Manager of Bovaird Oklahoma Stores

F. J. ROBBINS

Raymond E. Batchelor, general manager of stores, has announced that F. J. "Doc" Robbins, Oklahoma City, has been appointed district manager for Bovaird Supply Co. stores in Oklahoma.

Robbins was first employed by Bovaird in 1924 as a price clerk. In 1926 he became field man at Seminole and Midland and special salesman of Bovaird elevators and spiders in various territories. He was later made store manager in Oklahoma City, and in 1930 was appointed district manager for Oklahoma. Robbins held this position until 1945, at which time he formed a business of his own to handle specialty accounts.

John Nooter Boiler Works Changed to Nooter Corp.

John Nooter Boiler Works Co., pioneer in steel and alloy plate fabrication since 1896, has become Nooter Corp. Beginning as a small job shop serving St. Louis, the company steadily built a reputation in the manufacture of horizontal return tubular boilers, and then went into the specialized manufacture of tanks and pressure vessels.

As the demand for Nooter's services increased in these fields, their scope of service grew to such a point that Nooter was no longer just a "boiler works" as the name implied. That's why the John Nooter Boiler Works Co. name has been changed to Nooter Corp.

Griffith Made District Manager by National

W. M. Griffith has been named district manager of the southern area, Pacific Coast territory of the Superior Engine division of National Supply Co. The announcement was made by Robert M. Pearson, manager of sales of the division, which manufactures diesel engines.

With Griffith's appointment, the diesel-engine manufacturer has established the second of two West Coast sales offices. The other is located at Portland, Ore., with northern coastal region sales in charge of Louis R. Shults.

Griffith's headquarters will be at the Torrance, Calif., plant of National Supply, where Pacific Coast activities of the Superior Engine division are directed by Lewis L. Livesley.

Leschen & Sons Rope Co. Names New Officers

A. A. LESCHEN

D. W. VERNON

A. Leschen & Sons Rope Co., St. Louis, has announced the election of Arthur A. Leschen as president, and Douglas W. Vernon as vice president and general manager.

Leschen came with the company in 1902 after having attended Washington University. He is a grandson of Adolph Leschen, who founded the company in 1857, and the brother of Harry J. Leschen, who was president from 1915 to 1942. Since 1943 Leschen has served as vice president in charge of production. He succeeds the late William C. Henning who was president from 1943 until his recent death.

Vernon became associated with Leschen in 1945 as general manager of sales. In addition to his new duties as general manager he will continue to direct the activities of the sales department.

Reynolds Elected Secretary Of Morse Chain Co.

Walter M. Reynolds, Dearborn, Mich., has been elected secretary of Morse Chain Co., a division of Borg-Warner Corp. Reynolds also retains his post as controller of the division, which operates plants in Detroit, Ithaca, N. Y., and England.

Duties of treasurer have been assumed by R. P. Johnson, first vice president. The positions of secretary and treasurer now filled by Reynolds and Johnson were formerly combined in one office held by the late Stanley B. Waring of Ithaca. Reynolds was controller of Hughes Tool Co. of Houston prior to joining Morse Chain Co.

Shoemaker Sees Changes Due to Torque Converter

F. G. SHOEMAKER

A revolutionary change in the arrangement and method of operation of many types of power machinery as the result of a far wider use of torque converters is predicted by F. G. Shoemaker, consulting engineer of the Detroit Diesel Engine division of General Motors.

Shoemaker believes that we may expect to see machines with an almost human conception of motion as a result of the versatility made possible by further application of the torque converter. "The torque converter is another of the 'intelligent machines' which are attracting the attention of engineers in many types of work today," says Shoemaker.

"Its use permits a power plant to instantly adjust its output so that it will not stall when the going becomes heavy, nor race itself to destruction when suddenly relieved of its load. It eliminates the clash of gears and the jar of mechanical clutches. Its power application is firm but smooth and consequently contributes greatly to the life of the power equipment.

"Its characteristics made possible applications which allow sudden and frequent changes in speed and load which would be impossible with any other form of transmission thus far developed. As a result of all these capabilities, we may see some startling changes in the next few years in earth-moving, hoisting, oil-field apparatus, and many other types of equipment."

Ratigan Moves to California

C. J. "Chuck" Ratigan, sales manager for J. P. Ratigan, Inc., has moved his headquarters from Shawnee, Okla., to the Los Angeles office. He will continue to keep contact with the industry in the Mid-Continent area by making periodic trips through Oklahoma, Kansas, Texas, Arkansas, and Louisiana.

Burns Goes to California For Geolograph Co.

W. J. BURNS

W. J. (Bill) Burns has been named district manager of Geolograph Co.'s office at Bakersfield, Calif. He attended Tulsa University prior to employment with Schlumberger Well Surveying Corp., and Eastman Oil Well Surveys. Since April 1948 he has worked out of the Oklahoma City office of Geolograph Co.

Frank High has been transferred from Oklahoma City to Wichita Falls, Tex., to assist Rex Ballinger, district manager of Geolograph's Wichita Falls office.

Lindskog Made Manager of Glitsch New York Office

G. W. LINDSKOG

Gordon W. Lindskog, assistant manager of the New York office of Fritz W. Glitsch & Sons, Inc., Dallas, manufacturer of bubble towers and internals, has been named manager of the New York office.

A University of Washington graduate, he formerly worked for M. W. Kellogg and National Transit Pump & Machine. The New York office serves New York, Pennsylvania, Delaware, Maryland, the eastern seaboard, and eastern Canada. Lindskog succeeds Robert W. Fowler, who moved to Dallas recently as general manager of sales.

Ideco Makes Mills Product Manager, Oil Field Sales

Appointment of Kenneth L. Mills as product manager of oil-field sales, Columbus division, has been announced by International Derrick & Equipment Co. The Columbus, Ohio, plant manufactures Ideco's pumping units and oil-field structures.

In his new position Mills will correlate the work of the Columbus division's engineering, production, and quality-control departments and also give technical assistance to the company's oil-field sales division.

A graduate of Rice Institute, Houston, Mills joined American Manufacturing Co. of Texas in 1934 and was chief engineer when he left there in 1940 to accept a similar position with the Tulsa branch of Bethlehem Supply Co. In 1934 he became works manager of Texasteel Manufacturing Co., Fort Worth. At the conclusion of the war, Mills joined Emsco Derrick & Equipment Co., Houston, as assistant chief mechanical engineer.

Manhart and Associates Form Consulting Firm

T. A. MANHART

T. A. Manhart has announced the formation of a new exploration contracting company, Petroleum Consultants, Inc., with headquarters offices at Tulsa. This company will offer to the oil industry geological and seismic services on a contract basis. At the first directors' meeting, T. A. Manhart was elected president; Carl W. Blakey, vice president; J. L. Friendly, vice president, and Fred W. McMahon, secretary-treasurer.

T. A. Manhart, former executive vice president of Seismograph Service Corp., has been in the geophysical contracting business in Tulsa since 1933, and previously was associated with the teaching staff at Colorado School of Mines, Golden, Colo.

Clark Millison, a prominent consulting geologist in Tulsa, will perform the geological services for Petroleum Consultants as geological consultant. Blakey, former Rocky Mountain district manager for Seismograph Service, has moved to Tulsa where he will assume active charge of field operations. Friendly, former director of manufacturing for Seismograph Service, will be in charge of all equipment and instruments. Fred W. McMahon, formerly associated with Deep Rock Oil Co., will be in charge of administrative and accounting work.

Camco Offers Gas Lift and Gas Measurement Service

Camco Service, Inc., a newly formed firm with offices in Midland and Odessa, Tex., will offer a complete gas-lift and gas-measurement service to the Permian basin area, specializing in Camco gas-lift valves, time-cycle controllers, pressure controllers, and other equipment used to control and measure gas.

A need for this type of service has been created by increased availability of high-pressure gas in fields of the area, due to the completion of several casing-head gas plants, repressuring, and compression plants.

Officers of Camco Service are E. A. Wahlstrom, president; J. P. Gibbins, vice president; Roy A. Minear, secretary-treasurer; J. B. Richards, general manager; and Hugh L. Johnston, Jr., sales engineer.

M-M Engine Used In Unusual Service

Northwestern Refinery Co., located on the Mississippi River at St. Paul Park, Minn., operates under unusual conditions and has developed some unusual methods of handling its charge stock.

Being located a great distance from its oil supply and unusually cold weather encountered during winter months are the two principal complications. Through summer months, crude oil is brought up the Mississippi in large barges and unloaded at the refinery. During the winter months, however, when the upper Mississippi is choked with ice, oil is brought to the plant in tank cars. An 8-in. suction pipe extends the length of the unloading track.

Oil is pumped from the tank cars to crude storage tank by suction pump powered by a Minneapolis-Moline

New York Nomads Entertain Guests at Golf Party

With a record turnout of 131 guests and members, the New York Chapter of Nomads held a golf party at Scarsdale Golf Club on September 20. Prize winners were: Nomad John Evans, low gross and repeat winner of the president's trophy; Jerry Weeks, guest winner for low net; Harold Busold, guest winner for low gross; and Nomad Bob Cumming, for low net

206-4A, operating on gasoline, and cars are emptied at an average rate of 250 bbl. per hour. Unloading speed is facilitated by preheating the oil to about 100° F. with steam from a pipe laid parallel to the suction pipe.

Dowell Transfers Harris To Houston Station

R. S. "Bob" Harris, who has been with Dowell Incorporated since 1940, has been added to the organization's district operating station in Houston. The announcement was made by R. D. Shaw, general sales manager of Dowell, a service company specializing in cleaning steam-generating and heat-exchange equipment, and servicing the petroleum industry. Harris, formerly stationed in Beaumont as sales engineer, has had several years' experience in industrial treating. He has served with Dowell in the New York and Philadelphia industrial areas and in Illinois.

Decker Makes Extended Oil Country Trip

E. L. Decker, president of Martin-Decker Corp., Long Beach, attended the annual meeting of American Association of Oil Well Drilling Contractors. From Dallas he went to Houston to confer with Reed Roller Bit Co., Mid-Continent distributors for Martin-Decker. His itinerary then took him to Casper, Wyo., where he met Mutt Donovan, and they motored to Calgary and Edmonton, studying Canadian conditions.

Fluor to Build Mathieson Sulfur-Recovery Plants

Fluor Corp., Ltd., Los Angeles, has announced an agreement with Mathieson Chemical Corp., New York City, whereby Fluor becomes Mathieson's sole licensing agent for the engineering and construction of sulfur-recovery plants in the United States and Canada.

Plants engineered by Fluor will embody Mathieson's Sasco processes for the recovery of sulfur from hydrogen sulfide gas, acid sludge, and similar refinery waste products.

According to the agreement, Mathieson will grant licenses for the use of its sulfur-recovery processes only to those firms nominated by Fluor and will supply the necessary technical information, as well as the services of technicians, who will assist in the design and operation of plants licensed under the agreement.

Core Lab Opens Canadian And South American Points

S. T. GARY

E. ALLEN, JR.

W. H. Davison, president of Core Laboratories, Inc., Dallas, has announced the establishment of permanent base points for Core Lab services in Calgary, Alta., Canada, and in Maracaibo, Venezuela. These points have been set up in order more adequately to serve the demand for reservoir-engineering services in those areas.

The South American company will operate as a subsidiary organization under the name Core Laboratories—Venezuela, Inc. Both points will serve as base for the latest type of Core Lab portable well-logging and core-analysis units, and other standard reservoir engineering services.

Sam T. Gary will manage the firm's Canadian operations, and Ernest Allen, Jr., will head the new Latin-American division.

Gray, a graduate of Virginia Military Institute, has had several years of experience in all phases of Core Lab's services, plus 3 years in the same type of work for Carter Oil Co. in Illinois and Oklahoma.

Allen, a graduate of Texas University, has recently completed 2 years of petroleum-reservoir-engineering work in South America for Phillips Petroleum Co. Prior to his service with Phillips he was employed by Core Lab.

Herbert Joins Technical Staff of Enjay Co.

Gregory M. Hebert has joined the technical staff, Paramins division, of Enjay Co., Inc. He was formerly with Standard Oil Development Co., central technical organization of Standard Oil Co. (N. J.) affiliates, engaged in research and field testing of lubricants and fuels. He is a graduate in civil engineering of University of Illinois.

Canadian Bank Retains Galloway as Consultant

John O. Galloway, petroleum consultant, has been retained by Canadian Bank of Commerce because of the growing importance of the oil industry in Western Canada. Galloway was formerly executive vice president of California Standard Co., and was in charge of exploratory operations for Standard Oil Co. of California in Western Canada during the last 11 years.

He resigned from California Standard in August and opened offices in Calgary as a petroleum consultant. His connection with Canadian Bank of Commerce makes available to the bank an experience covering 25 years' service in the Mid-Continent, California, and Western Canadian areas.

Wells Rejoins Graver Construction Organization

L. K. WELLS

Graver Tank & Manufacturing Co., Inc., East Chicago, Ind., has announced the return of Lloyd K. Wells to the company as manager of the Southern division of Graver Construction Co. with headquarters at Houston. Wells left Graver in 1946 because of ill health. From 1940 until 1946 he was manager of the construction division of Graver. This division later became Graver Construction Co.

Wells attended Oklahoma A. & M. College where he studied civil engineering. From 1925 until 1930 he was associated with M. W. Kellogg Co., and in 1930 joined Alco Products-Transamerican Construction Co. With both Kellogg and Transamerican he was job superintendent in many phases of refinery construction.

Rees in Mexico City

Earl Rees, Patterson-Ballagh export manager, is currently visiting in Mexico City. This is one of several stops he plans to make en route to a tour of the South American fields. After visiting the oil fields in Venezuela and Trinidad, Reese will return to his California headquarters via the Patterson-Ballagh New York office.

Oil Center Tool Licenses Canadian Manufacturer

Oil Center Tool Co., Houston, has announced that it has entered into an agreement with Canadian-Vickers, Ltd., of Montreal, Que., which will allow the Canadian firm to manufacture and sell Oil Center Tool products to the Canadian oil-field market.

Oil Center Tool has made avail-

(Continued on page 184)

Classified Advertising

The Market Place for the Oil Industry

UNDISPLAYED

All ads, 12 cents a word. Minimum charge, $3.00 per insertion.
Centered Line, any ad, $1.00.
Box Numbers count 9 words when replies are to be sent to our Tulsa Office. Replies forwarded without charge.

DISPLAYED, PER INCH

$12.00 per column inch per insertion. One-point border and 12-point capitals are allowed. Larger type sizes not accepted.

All classified advertising payable in advance.
10% Discount if 3 insertions are ordered at one time.
COPY DEADLINE, 9:00 a.m. Monday prior to each week's issue.

THE OIL AND GAS JOURNAL
P. O. Box 1260, TULSA, OKLAHOMA

EQUIPMENT FOR SALE

FOR SALE: Cardwell Rotary Rig, complete with Mast. Suitable for 3,500 ft. drilling. Bargain. Terms. Melton Supply Co., Seminole, Okla.

FOR SALE: Two like new 74,000 bbl. cap. tanks. Low price, at Morgantown, W. Va. 2 new 10,000 bbl. bolted at N.Y. Darien Corp., 60 E. 42nd St., N. Y., N. Y.

FOR SALE: Two Fairbanks-Morse Diesel Engines, 150 H.P. Twin Cylinder Horizontal Type. Completely overhauled. $1500.00 each. Melton Supply Co., Seminole, Okla.

BREWSTER DRILLING RIG 5000 ft. depth, Moore 87 ft. jack knife. Excellent condition. Address "Drilling Rig," Box 949, Henderson, Texas.

Several Army Surplus 4½" x 6" Gas-Duplex 1860 Pumps—two piece skid mounted with Chrysler 8 cylinder engines. Will sell pumps only or complete units about half price.

R. H. COFFIELD
ATTN: W. H. Orr
Phones: 132—Rockdale, Texas
A-86064—Houston, Texas

FOR SALE

One Wilson Giant Hydromatic rig complete with 129' L. C. Moore derrick and 6000' 4½ drill pipe. Rig capable of drilling 8000'. Completely equipped, in excellent condition and ready to drill.

One Wilson Atlas Rig complete with 129' L. C. Moore derrick and 6000' drill pipe. 4½. Rig capable of drilling 9000'. Completely equipped, in excellent condition and ready to drill.

Priced for immediate delivery, subject to prior sale at $65,000.00 each.

JOE FOWLER
1009 City Nat'l Bldg. Phones 2-5401-2-3
Wichita Falls, Texas

EQUIPMENT FOR SALE

FOR CABLE TOOLS
DEGEN PIPE AND SUPPLY CO.
Box 107, Red Fork Station, Tulsa, Oklahoma

FOR SALE: McKissick Tubing and Floor Blocks. Save 50%. Melton Supply Co., Seminole, Okla.

FOR SALE: Skid mounted double drum spuader, 5000 foot capacity, complete. Box D-223, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE: R L Spudder completely equipped. NEW 5000'—9/16" sand line and NEW 5500'—⅞" drilling line. Unit in exceptionally good working condition. Write Box 647, Great Bend, Kansas.

FOR SALE: D-13000 Caterpillar Diesel Engine, $2,500.00. F-23 O.C.S. Jackshaft Clutch $600.00; C. O. Jones, Box 510, ElDorado, Kansas.

FOR SALE at Bartlesville—1 ELI Shot Hole Drill Truck with 4" x 5" Gardner Denver Pump mounted on 1945 1½ ton Ford Truck, $2,000.00. Cities Service Oil Co., Patridge, Bartlesville, Okla.

FOR SALE: Cardwell Model "RL" Spudder complete. Waukesha Motor, almost new lines, steel roof and floor, side curtains, new doghouse, two complete strings of tools, Koehler light plant. 1250 gal. Butane tank—now on location near Grayville, Illinois. Geo. H. Wickham, Box 595, Phone 149, Grayville, Illinois.

New Wire Rope at Money-Saving Values: Leading brands. Sizes ¼" to 1⅛", 6x19, 6x37, construction for all purposes. Degen Pipe & Supply Company, Box 107, Red Fork Station, Tulsa, Oklahoma.

FOR SALE

12—230 H.P. Type 10 Bessemer New 17" Power Cylinders complete ready to run with 16" to 18" Compressors. 1—230 H.P. Clark Horizontal with Compressors. Located Salem, Illinois.

ENGLE PETROLEUM, Incorporated
Box 655, Evansville, Indiana

NEW
FRACTIONATING TOWER
REFLUX DRUM

One (1) New fractionating tower, 5'-0" I.D. X 89'-6" over-all height X 1⅛" plate. Thirty-four (34) bubble trays, ten (10) 18"-300# manways. Stress relieved and built in accordance with API-ASME Code for 350 PSI working pressure.

One (1) new horizontal reflux drum, 5'-6" I.D. x 18'-6" over-all length x 1⅛" plate. Stress relieved and built in accordance with API-ASME Code for 350 PSI working pressure.

ROCK ISLAND OIL & REFINING CO., INC.
335 West Lewis St. Wichita, Kansas
Phone 7-3325

EQUIPMENT FOR SALE

FOR SALE: Mayhew Shot Hole Drilling Rig mounted on 1947 Ford truck. 550 gallon water tank mounted on 1947 Ford truck. Complete with all equipment, in good condition, ready to move on job. Priced to sell. F. W. Brown, Box 607 or Phone 400, Britton, Oklahoma.

FOR SALE: Reboiler, Jackson Engineering, size 16-35-75, tube pressure 175 lbs., temperature 380° F. Model =1. Heater =265. Excellent condition. Box 610, Mt. Pleasant, Texas.

ONE Ironcraft and five Kelpsch type floating marsh buggies. For inspection and price bid contact James. Linden 5108, or mail inquiries to 1012 Claxton Street, Houston 17, Texas.

PACKAGED H_2S REMOVAL UNITS

We offer prompt shipment on skid-mounted hydrogen sulfide removal units for treating sour gas for pipe line or fuel gas purposes.

GRAFF ENGINEERING & EQ'PT. CO
9415 Westminster, Dallas 5, Texas

STEEL STORAGE TANKS

Railroad Tank Car Tanks, 6,500 to 12,000-Gal. Cap. Coiled and Non-Coiled.

Cleaned—Painted—Tested
Heavier—Safer—Cheaper
Other Tanks, Too.

Also — Complete Tank Cars 8,000 and 10,000-Gal. Cap.

Your Inquiries Solicited

NEWHALL-MARSHALL-WOOD, INC.
30 Church Street New York 7, N. Y.
Phone: COrtlandt 7-8090

FOR SALE

In excellent mechanical condition located in West Texas:

1, IDECO Model PR-150 Drawworks complete with air flex clutches and 145-GKU Waukesha Gas-Gasoline-Butane engine with Brown Lipe transmission.
1, 5 x 10 Gardner-Denver power pump unitized on steel skids with Model L-525 Buda Gas-Gasoline-Butane engine.
1, 87' Lee C. Moore Jack Knife Derrick complete with sub base and with 5' substructure, walks and stairs.
1, Brewster Model OB 12" Rotary Table with master bushings.
1, BJ Model 75 hook.
1, 1½ KW Kohler Light Plant.

Equipment must be seen to be appreciated.

Write, wire or phone

EMPIRE MACHINERY COMPANY, LTD.
Box 4026, Phone LD 18 or 9161,
Odessa, Texas

COMBINED VAPOR SEPARATOR & FRACTIONATOR FOR THERMAL REFORMING

One (1) New 5'-6" ID x 61'-0" over-all height Bubble Tower made of 1¼" Plate and lined throughout with 5 64" and 7/64" thick, 11-13% Chrome stainless steel, type 405. Stainless steel support plates in place for 15 Trays. (Trays not included). Constructed in accordance with the API-ASME Code, stress relieved and radiographed. Designed for 400 PSI @ 750° F. Fabricated by A. O. Smith Corporation. Platform and ladder clips installed.

WOOD RIVER OIL & REFINING CO., INC.
335 West Lewis Street, Wichita, Kansas
Telephone 7-3325

FOR SALE

120,000'—6⅝" OD, 17.65#, seamless, range 3, beveled.
80,000'—4½" OD, 8.65#, seamless, range 3, beveled.

Ready for immediate delivery, A-1 every respect, priced to sell. Location, Tulsa, Oklahoma.

W. C. BERRY
Box 1858 Tulsa, Oklahoma Phone: 3-6141

EQUIPMENT FOR SALE

FOR SALE

5—35,000 bbl. steel tanks, riveted, 5' x 10' steel sheets, 6 rings high, complete shell, bottom, angles and ladder, cut down, rivets backed out, approximate weight 90 tons each. Price $3,000.00 each, gradesite, Stoy, Illinois.

W. C. BERRY

Box 1858 Tulsa, Oklahoma Phone: 3-6141

FOR SALE: In West Texas, Model 61 Wichita Spudder, complete with 150 H.P., LeRoi Drilling Engine, all tools, dog house, light plant, and Shear Pole Mast. Rig is mounted on 12" I Beam Skids. Box D-228, The Oil and Gas Journal, Tulsa, Oklahoma.

CORE Drilling & Shot Hole Rigs; Longyear, Sullivan, Franks. New and used equipment, ready for service. PK rods, N rods, B rods, bits, Spudders and cable tools. Everything for well drilling. We save you money. Pressey & Son, Pueblo, Colo.

FOR SALE: 1—Pipe pulling outfit complete with Caterpillar tractor, and Cardwell single drum winch, with spudder attachment, 48' wood-A-Mast and all tools. Price $3500.00; 1—Extra Pipe pulling pole mounted on dual wheel rubber-48'-long-5-sheave Western Iron crown. Price $1000.00; 1—Converted Star spudder, #26 Caterpillar 30—Tractor powered—Tools, but no lines. Price $1750.00; L. B. Finney, Box 455, Madison, Kansas.

FOR SALE: Complete Oil Field Electric Generating Plant now furnishing electricity to pump thirty-four producing wells. Contact A. B. Allen, Flora, Illinois.

#24-L Bucyrus-Erie . . . gasoline engine . . . catheads . . . semi-trailer mount. Two years old, no tools, for sale or trade for #36-L. Rig near Dubuque, Iowa. Box D-235, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE: Foxboro, Westcott and Emco Orifice Meters with Piping, Mercury and Leveling Saddles. Also Davis and Chaplin-Fulton Regulators. George R. Milner, Okmulgee, Oklahoma.

OLD style vertical magnetometer, compensated for temperature, 180 degree stops, also Helmholtz Coil in good condition. Very good instrument. $1000. V. E. Karnes, 1088 Amarillo St., Beaumont, Texas.

404 CORE BARREL—Drills faster, takes larger core, runs in 6¼ inch casing. Makes 2⅞ inch core. Prices quoted on request. Mf'g by East Side Machine Works, 17 S. Ashby, Chanute, Kansas.

LINE PIPE

Subject to prior sale we offer 200 miles used 10" lapweld 40 lb. line pipe, plain end, bevel 30° for weld, located in Missouri. This pipe is part of 435-mile line replaced by the 22" Ozark pipe line system and was operating at 780 lb. pressure when taken out of service. Dismantling and reconditioning of this pipe is now in progress and available for inspection. Price $1.65 per foot, F.O.B. Missouri shipping points.

Left over from construction of Ozark system, we offer 15,000 ft. new 22" 79 lb. P.E. and E.W. line pipe, located near St. Louis, Missouri.

SHELL PIPE LINE CORPORATION
Care of J. B. Thompson, P.O. Box 2648
Houston, Texas Phone LD-855

FOR SALE

NEW ½" to 2" incl. GALVANIZED PIPE

Used Pipe:

2½" Standard Black Line Pipe, P.E.
4" Standard Black Line Pipe, P.E. or T&C
5½" O.D. 13# & 17# Casing
6⅝" O.D. 13# Casing
7" O.D. 17# & 20# Casing
8⅝" O.D. 17# & 24# Casing

BANKOFF PIPE & SUPPLY COMPANY
823 North Lewis Phone 6-2119
TULSA, OKLAHOMA

FOR SALE: 15,000' of 6⅝" O.D. line pipe—40' lengths—excellent condition. H. L. Smith, St. Elmo, Illinois. Phone 115.

EQUIPMENT WANTED

WANTED: Fort Worth Jumbo "D" spudder. Preferably without tools or engine. Quote price, year, condition, and location. G. W. Hicks, Box 125, Moline, Kansas.

HELP WANTED

WANTED

Service station maintenance man familiar with all details of construction of stations and bulk plants and who can handle men. Large independent. Year around work. Write in detail about experience, ability, salary desired, etc. Box D-233, The Oil and Gas Journal, Tulsa, Oklahoma.

ENGINEERS, Executives, Technical Men Salaried positions—$3600 to $30,000. This confidential service for outstanding men who desire a change of connection, will develop and conduct preliminary negotiations without risk to present position. Send name and address for details. Tomsett Associates 1204 Berger Bldg., Pittsburgh 19, Pa.

REFINERY ENGINEERS

An American oil company operating in South America has openings for qualified graduate engineers:

EQUIPMENT INSPECTORS

Mechanical Engineers with 3-6 years in refinery with substantial equipment inspection experience. Will arrange and conduct inspections, request equipment renewals due to corrosion, failure or defectiveness in conformance with accepted safety codes. Will conduct tests of equipment, study causes and prevention of corrosion and failure of metals.

STAFF ENGINEERS

Electrical and Mechanical Engineers with 3-5 years oil refinery experience. Must be familiar with design and construction of oil refinery process equipment, electric power plants and related projects. Field experience necessary.

Write us telling of your age, marital status, education and detailed experience resume. Your letter will be held strictly confidential.

Box 308-R

Radio City Station

New York 19, N. Y.

HELP WANTED

NEW foreign and domestic Oil Employment Directory. Over 500 listings in drilling, production, refining, natural gasoline pipe lines geological, exploration, supplies manufacturers, services, and trucking, refinery and pipe line contractors, showing where to apply for jobs. Price $5.00. Oil Industry Mailing List, Box 2603, Tulsa, Okla. (Our 28th year).

GEOLOGIST, with four or more years active experience in North Louisiana and able to qualify as district geologist. Headquarters in Shreveport. Prefer man under 35. State salary desired. Replies held in confidence. Box D-231, The Oil and Gas Journal, Tulsa, Oklahoma.

ENGINEER or thoroughly experienced oil man wanted capable of doing market research work in both drilling and refining division of oil business. Excellent future. Box D-232, The Oil and Gas Journal, Tulsa, Oklahoma.

SALES REPRESENTATIVE WANTED. Kansas and Oklahoma. Calling on oil well supply dealers. Liberal commission to qualified representative. Write age, experience and references. For complete details write Automatic Industries, 114 West 11th Street, Kansas City, Missouri.

SITUATIONS WANTED

ATTENTION: Well established oil well drilling contractor desires to manage and supervise: Individuals', groups', small or medium-sized oil companies' drilling, production and operating problems in Central and Western Texas, and New Mexico. Personal interview by appointment is desired. Makin Drilling Company, Box No. 131, Ph. No. 131, Hobbs, New Mexico.

SALES MANAGER: Well known oil field supply company closing Tulsa office, local manager desires connection as Manufacturer's Representative. Familiar with drilling production, refining sales. Have sold Texas Gulf Coast, and Oklahoma. Will travel. Box D-214, The Oil and Gas Journal, Tulsa, Oklahoma.

LEASEMAN: Experienced lease buyer desires temporary or permanent leasing and curative work. Location unimportant. Box D-212, The Oil and Gas Journal, Tulsa, Oklahoma.

LADY with extensive land, lease and legal experience desires either secretarial or office management with an independent. P.O. Box 2273, Casper, Wyoming.

REFINERY Superintendent—Desires connection with Independent Refining Co. Years of experience. Domestic & Foreign Reference furnished. Box D-218, The Oil and Gas Journal, Tulsa, Okla.

MECHANICAL ENGINEER: Registered Professional Oklahoma . . . Tulsa resident . . . 30 years old . . . eight years basic supervisory, and executive experience. Desires to invest in and assume portion of responsibility in manufacturing or selling organization. Box D-235, The Oil and Gas Journal, Tulsa, Oklahoma.

SEISMOGRAPH SUPERVISOR: 15 years contributor to art and to many domestic and foreign successes, desires change. Box D-238, The Oil and Gas Journal, Tulsa, Oklahoma.

CHEMICAL ENGINEER with 15 years experience desires position as production superintendent or assistant in small or medium sized plant. Engineering and production experience in heavy chemical, petroleum and petro-chemical industries. Available on 30-day notice. Box D-239, The Oil and Gas Journal, Tulsa, Oklahoma.

PURCHASING AGENT, 41. Desires permanent position, 18 years experience purchasing for oil refinery and bank, excellent references, available immediately. Robert Strange, 1124 Crocker Street, Houston 6, Texas.

TWO young ex-service pilots—Clean cut appearance—Three years college—Unmarried—Free to travel—Domestic or foreign—Extensive sales and business experience—Current valid CAA instrument ratings and Commercial pilot certificates (single and multi engine land and sea)—Familiar all types of aircraft—Desire positions as personal pilots and business aids—Excellent references—Refer inquiries to Box D-237, The Oil and Gas Journal, Tulsa, Oklahoma.

ROYALTIES

DEEDED ROYALTIES
San Juan Basin & Permian Basin. Write Harry S. Wright, Wright Bldg., Farmington New Mexico.

ROYALTIES IN HOT AREAS!
Recent strikes have focused attention on Montana's deeper oil zones and major companies are moving fast, drilling and leasing. We buy direct in the field, sell direct to our customers. Write LANDOWNERS ROYALTIES COMPANY, Box 1225, Great Falls, Montana.

LEASE AND DRILLING BLOCKS

WILL BUY gas or oil production, large or small. Prefer properties with some undeveloped acreage. Might consider drilling deals. Box D-172, The Oil and Gas Journal Tulsa, Okla

WILL ASSIGN ½ interest in rig and 300 acres direct offset 3-sides to long life sand production, Delaware Basin, West Texas, for necessary cash to drill and equip first three wells. If interested communicate immediately with owner. Box D-234, The Oil and Gas Journal, Tulsa, Oklahoma.

LEASES ROYALTIES

PRODUCING OR NONPRODUCING

Texas, New Mexico, Oklahoma, Louisiana and Illinois

Inquiries Invited

B. D. BUCKLEY

60 Broadway Drive, Clayton (5)

St. Louis, Missouri

NORTH DAKOTA MINERALS

Bought direct for you on purchase order. I am thoroughly familiar with this play. Wire, call or write

JOHN ALLEN
806 Clarence Parker Hotel
Minot, North Dakota

(Member National Oil Scouts and Landmen Association. References exchanged.)

IN EXCHANGE

For interest in oil leases to be produced, we will furnish brand new oil well casing, tubing and line pipe. Advise full details of the lease or leases you contemplate producing.

Box D-226

The Oil and Gas Journal, Tulsa, Okla.

Donald Bolls
NORTH DAKOTA
office
Clarence Parker Hotel,
Minot, North Dakota

Minerals Participating—Oil & Gas Leases available for immediate delivery in
Heart of Williston Basin Play.
Have experienced Buyers in field.
Former Major Company District Landman.
Major & Independent Company Leasing Experience.

LEASE AND DRILLING BLOCKS

WILL SELL ½ interest undivided or checkerboard 10,000 acres of leases and drill 4 wells. Four separate structures Northwest Colorado and Southern Wyoming adjoining major oil company holdings. Two structures proven for shallow gas. One structure within four miles of production and near recent Oak Creek, Colorado, wildcat discovery. Major oil company will join in drilling. Other structure near 2nd largest oil field in Colorado. Price $10.00 per acre —$100,000.00. S. Marvin James, K-bar-T Ranch, Meeker, Colorado. Phone Meeker 4.

COCHISE Co. Ariz., Drilling Block; Sulphur Sprgs. Valley, 8000 acres for 4000 ft test. Chas. Baldwin, Box 1107, Goodyear, Ariz.

OIL AND GAS LEASE
2665 Acres on Mid-Valley
Pipe Line Company crude oil. Pipe line (22 in.) 1000 mile line from Texas to Ohio. Survey South Central Kentucky. Owner will lease to principal oil companies only. John O. Eberman, Morgantown, Kentucky.

PRODUCTION FOR SALE: 1200 acre shallow lease. Present production about 25 bbl. per day. Room for 75 more wells. Two sands. Drilling rig, casing, all equipment go. High grade diesel oil. Have other larger producing properties, also large blocks of acreage. W. K., 506 White Street, Houston, Texas. Phone AT5830.

PATENT ATTORNEYS

PATENT Practice before U. S. Patent Office. Validity and Infringement Investigations and Opinions. Booklet and form "Evidence of Conception" forwarded upon request. Lancaster, Allwine & Rommell, Registered Patent Attorneys, Suite 418, 815-15th Street, N.W., Washington 5, D. C.

LEGAL BLANKS

BURKHART LEGAL BLANKS since 1906 Oil-Gas (all states), Business, Real Estate Legal Forms, Leases, Revised With Government Regulations, Commercial Printing. Catalog and Samples on request. Burkhart Printing & Stationery Company, 118 South Cincinnati, Tulsa 3, Oklahoma

SERVICES

INSPECTION SERVICE
A group of experienced refinery inspectors are forming an independent inspection service to provide inspection service to refineries, gasoline plants, and to provide other inspection services required by customers. Proposed starting date of service to be January, 1950. Headquarters to be in Houston, Texas. If interested please write for details. Box D-217, The Oil and Gas Journal, Tulsa, Oklahoma

BUSINESS OPPORTUNITIES

ATTENTION
UTILITIES

Now organizing to furnish gas service to various communities. We will supply **BRAND NEW STEEL PIPE and TUBING** for stock in your company. Give us full details proposed distribution system and financial setup.

Box D-225

The Oil and Gas Journal, Tulsa, Okla.

EQUIPMENT MEN

(Continued from page 181)

able to Canadian-Vickers organization all technical help and advice to insure that Canadian-O-C-T products fully meet all material specifications and inspection requirements of O-C-T products.

Canadian-Vickers is a firm of long standing in the manufacturing of specialized equipment and in the shipbuilding trade. Earlier this year, Oil Center Tool licensed LeGrand, Sutcliff & Gell, Ltd., of England, for the manufacture of O-C-T products for sale to firms doing business on a pound-sterling basis.

Allman Speaks to Indiana Petroleum Association

Les Allman, vice president of Fruehauf Trailer Co., Detroit, will be among the guest speakers at the 2-day convention of the Indiana Independent Petroleum Association at Indianapolis, October 13 and 14. Allman will talk on "People's Pocketbooks in Peril."

Frank Morris & Co. Formed

Frank W. Morris, formerly district manager, Spang-Chalfant, has announced the formation of a new company, Frank Morris & Co.

The company, which will be located in the Oil Capital Building, Tulsa, will represent Mercer Tube & Manufacturing Co., Globe Steel Tubes Co., Speakman Co., and Dravo Corp.

Cunningham Elected President of A.S.M.E.

Election of James Cunningham, president of Republic Flow Meters Co., Chicago, as national president of the American Society of Mechanical Engineers for 1950, has been announced. Four regional vice presidents and two directors-at-large also were named. The new officers will assume their duties at the end of the 1949 annual meeting, to be held in New York, November 27 to December 2.

Cunningham will succeed James M. Todd, consultant engineer of New Orleans, as president of the A.S.M.E. Cunningham served as vice president of Clyde Machine Works Co. from 1909 until 1911 when he left to found and become president of Steam Appliance Co., now Republic Flow Meters Co., manufacturers of industrial instruments and controls.

Bucyrus-Erie Names C. E. Stewart to Succeed Neely

Promotion of C. Earle Stewart, Williamstown, W. Va., to the position of district representative, well-drill sales, for the Evansville, Ind., sales district, has been announced by Bucyrus-Erie Co., South Milwaukee, Wis. Stewart, who succeeds Henry C. Neely, will continue to make his headquarters for the present in Williamstown.

To his new position, Stewart brings over 25 years of experience in the oil, gas, and water-well drilling

fields. Having served in the capacities of tool dresser, driller, and drilling superintendent, Stewart is familiar with the application and operation of drilling equipment. More recently, he traveled in Michigan, Ohio, Virginia, and West Virginia as drill sales representative for the line of water-well drills and tools manufactured by Bucyrus-Erie.

Clapp Instrument Co. Appoints New President

At a recent meeting of its board of directors, Clapp Instrument Co. appointed Arthur S. Brown as president. At the same meeting, Charles Clift was appointed treasurer, and T. W. Lanman, vice president. Brown has a wide background of experience in the instrument business, having been formerly associated with Manning, Maxwell & Moore; Mason-Neilan Regulator Co., and Fischer & Porter Co. He has been acting as general manager of the business for several months.

Woodworth Made Wright Hoist Sales Manager

S. J. Woodworth has been appointed sales manager of Wright Hoist division of American Chain & Cable Co., Inc., with headquarters at York, Pa. He succeeds A. R. Haskins who has resigned from the company.

Woodworth has been with Wright Hoist Division for over 25 years, and has had wide experience with hoisting applications and materials-handling problems.

Worthington Assigns Lewis To Export Department

Harry E. Lewis has been assigned to the foreign and export department, Worthington Pump & Machinery Corp., Harrison, N. J. Lewis was formerly Works comptroller, Holyoke, Mass., Works. George Bourque has been appointed Works comptroller to succeed Lewis.

Kerotest Elects Frame and Isaacks Vice Presidents

William Frame and J. D. Isaacks, of Kerotest Manufacturing Co., have been elected vice presidents, it has been announced by S. J. Roush, president. Isaacks has been named vice president in charge of steel-valve sales, and Frame will serve in his former capacity of works manager in addition to his duties as vice president.

Frame joined Kerotest recently as works manager after having been associated with National Supply Co. for 14 years as works manager of its Spang-Chalfant plant at Ambridge, Pa. Isaacks was formerly district manager for Kerotest in Houston, and is widely experienced in oil-field and pipe-line sales.

Smith Is Sales Manager of Glass Fibers Mat Division

W. R. Smith has been appointed sales manager of the Mat division of Glass Fibers, Inc., according to an announcement by R. W. Capaul, general sales manager of the Waterville, Ohio, concern. Previously, Smith was in various sales and expediting capacities with the investment firm of Stranahan, Harris & Co.; Willys Overland Motors, Inc.; Hickok Oil Corp., all of Toledo, and with Curtis Publishing Co., Philadelphia.

Wilson and Ellis Made Buffalo Vice Presidents

Buffalo Pumps, Inc., Buffalo, has announced the election of Henry D. Wilson and Bruce W. Ellis to the board of directors. Wilson was graduated from Louisiana Tech in 1927. Taking a position in the engineering department of Buffalo Forge Co., the parent organization, he moved into engineering sales in 1930. In 1942 he was transferred to Buffalo Pumps, Inc., as superintendent. Ellis was graduated from Rensselaer Polytechnic Institute in 1932. Entering the employ of Buffalo Pumps, Inc., in 1935 as an engineer, he became assistant chief engineer and in 1944, chief engineer, in which position he continues.

Consolidated Begins New Pipe Mill at Houston

Houston has been chosen as the site for a new electric welded steel pipe mill to be built by Consolidated Western Steel Corp., it has been announced by Alden G. Roach, president of this United States Steel subsidiary. Preliminary construction work has begun on property owned by Consolidated Western near the Houston Ship Channel. It is expected that the new plant will be in operation in the spring of 1950.

New facilities will provide an annual capacity of 100,000 net tons of 24-in. diameter and larger electric welded and expanded steel pipe, and will enable Consolidated to compete in the Texas area, and particularly in the market for large-diameter pipe required for long-distance oil and gas pipe lines. The new plant's capacity will be approximately 50 miles of large-diameter pipe a month. At present United States Steel has no facilities for the production of this type of pipe east of the Rocky Mountains or south of the Pittsburgh area.

"In the selection of Houston as the location for its new mill, Consolidated Western Steel Corp. is carrying out a plan to provide Texas fabricated pipe to the growing network of oil and gas transmission lines originating in the Lone Star State," Roach said.

Statement of the Ownership, Management, Etc., of

THE OIL AND GAS JOURNAL

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Known bondholders, mortgagees and other security holders holding 1 per cent or more of the total amount of bonds, mortgages or other securities: None.

S. H. ROURKE,
Business Manager.

Sworn to and subscribed before me this 27th day of September, 1949.

JOHN P. GALLAGHER,
Notary Public.

My commission expires March 1, 1951.

Eastern Kentucky

(Continued from page 172)

shack Uplift, and close to the axis of the Cincinnati Arch.

In Carter County, 25-X-78, Arch Carpenter on a farmout from California Co. is drilling at 2,000 ft. at the 1 Virgil Ramey. This test is designed to probe Cambro-Ordovician formations and will help to evaluate a wide expanse of territory hitherto unexplored.

INDIANA

EVANSVILLE.—An oil discovery of more than average importance for this area appears to have been made by George & Wrather and J. W. Havens in their 1 Henry Titzer, SE NE SW 17-3s-10w, Gibson County. Operators recovered 330 ft. of clean oil in a drill-stem test of Tar Springs sand at 1,543-52 ft. In addition to the oil, the test got 30 ft. of drilling mud, but no water was evident. At the total depth, the hole still was in sand. Casing has been run, preparatory to production tests.

A mile northwest of Union, in the Union-Bowman pool, Pike County, Wabash Petroleum Co. is completing what looks like another exceptionally good well for the area in its 1 Les Troxler, SE NE SE 30-1n-9w. The well bailed at the rate of 15 bbl. of clean oil daily while drilling the Rosiclare lime at 1,653-55 ft., and has 5½-in. casing at 1,650 ft. It is about ½ mile northeast of a well completed last month by the same company which flowed at the rate of 24 bbl. per hour from the same pay.

INDIANA SUCCESSFUL WILDCAT

Posey County: C. E. Skiles 1 Spencer-Vogel Comm., NE NW NW 14-8s-14w, IP 70 bbl., McClosky 2,883-91 ft., TD 2,896 ft (Extension Spencer pool.)

INDIANA WILDCAT FAILURES

Clay County: C. E. Skiles 1 W. Schafer, NE NE SW 8-9n-6w, dry, TD 1,730 ft.

Gibson County: Clarence Wood 1 Crawford, NE NE SE 33-3s-12w, dry, TD 2,701 ft.

Pike County: United Drilling Corp. 1 Williams, SE SE SW 6-1n-7w, dry, TD 1,360 ft.

Ralph Halbert 1 Rudolph, SW NW NW 19-1n-7w, dry, TD 1,325 ft.

Sullivan County: C. W. Dittman and L. Ormiston 1 M. Riggs, SE SW SW 15-8n-10w, dry, TD 2,798 ft.

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CALENDAR OF EVENTS

October

American Association of Petroleum Geologists, regional meeting, Buena Vista Hotel, Biloxi, Miss., October 12-14.

Symposium on Instrumentation for the Process Industries, fourth annual session School of Engineering, Texas A & M College, College Station, Tex., October 12-14.

Texas Mid-Continent Oil and Gas Association, annual meeting, Rice Hotel, Houston, October 13-14.

Natural Gasoline Association of America Southern Regional Meeting, Tyler Texas, October 14.

Oil Progress Week, October 16-22.

American Gas Association, annual convention, Chicago, October 17-20.

American Institute of Mining and Metallurgical Engineers, Petroleum Branch, fall meeting, Elk's Club, Los Angeles, October 20-21.

Western Petroleum Refiners Association, regional technical meeting on waste-disposal problems, Palmer House, Chicago, October 21.

American Institute of Chemical Engineers, South Texas Section, annual meeting, Hotel Galvez, Galveston, October 21.

National Safety Congress, Morrison Hotel, Chicago, October 24-28.

South Texas Geological Society, sixteenth annual meeting and field trip, San Antonio, October 28-30.

Independent Natural Gas Association of America, annual meeting, Baker Hotel, Dallas, October 31.

November

Pacific Industrial Conferences and Pacific Chemical Exposition, Civic Auditorium, San Francisco, November 1-5.

Society of Automotive Engineers: diesel-engine meeting, Chase Hotel, St. Louis, November 1-2; fuels and lubricants meeting, Chase Hotel, St. Louis, November 3-4.

American Petroleum Institute, annual meeting, Stevens Hotel, Chicago, November 7-10.

Rocky Mountain Oil and Gas Association, annual meeting, Cosmopolitan Hotel, Denver, November 17-19.

American Association of Petroleum Geologists, Society of Exploration Geophysicists, and Society of Economic Paleontologists and Mineralogists, Pacific Coast joint regional meeting, Ambassador Hotel, Los Angeles, November 17-18.

Petroleum Electric Power Association, annual conference, Hotel Beaumont, Beaumont, Tex., November 17-18.

Society of Exploration Geophysicists, regional exploration meeting, Adolphus Hotel, Dallas, November 17-18.

Exposition of Chemical Industries, Grand Central Palace, New York, November 20-December 3.

American Society of Mechanical Engineers, annual meeting, Hotel Statler, New York, November 27-December 2.

West Central Texas Oil and Gas Association, annual membership and technical meeting, Abilene, Tex., November 29.

December

American Institute of Chemical Engineers, annual meeting, William Penn Hotel, Pittsburgh, Pa., December 4-7.

Interstate Oil Compact Commission, annual meeting, Roosevelt Hotel, New Orleans, December 5-7.

American Chemical Society, southwest regional meeting, Oklahoma City, December 8-10.

NOMADS

Houston Nomads, second Monday of each month, Ye Ole College Inn, Houston.

Los Angeles Nomads, second Wednesday of each month, Jonathan Club.

Tulsa Nomads, third Friday of each month, After Five Room, Tulsa Hotel.

New York Nomads, annual invitation dinner, Louis Sherry's Restaurant, October 26; business meeting, Louis Sherry's Restaurant, November 21; annual Christmas party, Biltmore Hotel, December 3.

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